The FOUNDRY

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Greets Foundrymen for Third Time

Philadelphia, Birthplace of the American Foundrymen's Association, is Ready for Twenty-Fourth Annual Convention—Exhibition and Technical Programs Reflect Return of Industry to Peace Time Basis

FOR five days beginning Monday, Sept. 29, Philadelphia, the birthplace of American independence and the home of the first convention of the American Foundrymen's association, will for the third time entertain the foundrymen of the United States, Canada and abroad. As heretofore, the convention this year will include the annual meeting of the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers. It is especially fitting that the twenty-fourth annual meeting of foundrymen, the first in five years to be held in time of peace, is to take place in the city founded by William Penn, America's first well-known advocate of peace. The spirit of war, which so thoroughly entered into the activities of the last five annual meetings, will be noticeably absent this year. Especially striking will be the contrast between the Philadelphia and Milwaukee conventions. Last year, in the midwestern city, the enthusiasm of the 4000 foundrymen in attendance was focused exclusively on the work of winning the war; during the week of Sept. 29, the interest of visiting foundrymen will be centered upon the problems of reconstruction.

Evidence of many developments peculiar to the present era will be reflected in this year's convention. In keeping with the tendency toward closer international relations, the Philadelphia meeting will be marked by a distinctive cosmopolitan aspect to a degree never before approached. In view of this development, the meeting has been named the Inter-Allied Foundrymen's Convention and Exhibition. The return of peace is permitting foundrymen to direct their efforts along lines neglected during the war. Striking proof of this is found in the space require-

ments of exhibitors of foundry, machine shop and general industrial equipment who have demanded more than 60,000 square feet, an increase of 43 per cent over any previous show. The removal of the restraint of war also will be reflected in the program of technical papers. A special session on industrial relations has been arranged in order that the broad aspects of that problem, which are absorbing so much attention at this time, may be intelligently discussed. The consideration of reconstruction questions also will hold a prominent place in the program of technical papers to be presented before the American Foundrymen's association at sessions on steel, malleable, gray-iron and general foundry practice, and in the dozen or more papers to be presented at sessions of the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers. The 1919 annual meeting promises to outclass all previous conventions in every respect, and will emphasize, as never before, the tremendous growth of the association since its first annual meeting in the Quaker city 23 years ago. Although the opening sessions of the convention are scheduled for Tuesday morning, the registration office in the assembly room, Commercial Museum, will open Monday morning, Sept. 29, at 10 o'clock. Registration will continue from this hour until the close of the convention. Departing from the precedent of previous years, the exhibition of foundry, machine shop and rolling mill equipment in the Commercial Museums will open at 10 a. m., somewhat earlier than usual. Also the exhibition will be open Tuesday evening. The formal opening of the convention will take place in the ball room of the Bellevue-Stratford hotel Tuesday morning at 10 o'clock when members of the American Foundrymen's association and Institute of Metals division of the American Institute of Mining and Metallurgical Engineers will convene in a joint session. The address of welcome, annual address of the president of the American Foundrymen's association, and reports of the board of directors and the officers of the organization will be presented at this session, together with papers on brass foundry practice. The first professional session of the Institute of Metals division will be held at 2:30 p. m. Tuesday in the Ritz-Carlton hotel, and will be followed by two other sessions in the same hotel at 10 a. m. Wednesday and Thursday mornings. Condensed and detailed programs of both organizations appear elsewhere in this issue. The technical papers prepared for the American Foundrymen's association cover a wide range of subjects of unusual interest to foundrymen. Eleven distinct subjects are treated in the papers on miscellaneous subjects scheduled for presentation at the three sessions devoted to general topics. The authors of these papers will touch upon publicity work the use of audible signals in foundries, combining hoisting apparatus with molding machines to good advantage, sand handling equipment, concrete floors for foundries, the care of foundry equipment, uniform methods of foundry cost accounting, scientific management as applied to foundries, handling patterns in a large foundry, various problems of welding castings by the electric arc and gas processes, and the use of high temperature cement for lining cupolas. Six papers will be presented at the steel session to be held Wednesday morning. "Electric versus Converter Steel" is the subject of a paper to be presented by John Howe Hall and G. R. Hanks. E. H. Ballard will compare the costs of electric and open-hearth furnace practice. Moving pictures showing the welding of a large steel casting on the transport NORTHERN PACIFIC, which went aground off Fire island in January, will accompany a paper on that subject to be presented by Arthur F. Braid. W. A. Janssen, chairman of the committee on steel foundry standards, will submit the report of that committee. Among the subjects to be discussed in the six papers scheduled for the gray-iron sessions to be held Thursday morning are, "The Elimination of Strains in Cast Iron," by C. J. Wiltshire; "The Testing of Clays for Foundry Use," by Homer F. Staley; and "The Electric Furnace as an Adjunct to the Cupola," by George K. Elliott. The use of powdered coal in malleable practice will be discussed in three of the 10 papers to be presented at the malleable iron session to be held Thursday morning simultaneously with the sessions on gray-iron and industrial relations. A paper entitled, "A Note on Britain's Experimental Foundry," by G. Ernest Wells, Edgar Allen & Co., Sheffield, England, who was in the British ministry of munitions, is expected to prove of unusual interest to American foundrymen who have not had frequent opportunities to obtain first-hand information on English foundry practice. Prof. Enrique Touceda will discuss malleable castings and H. E. Diller will outline the results of annealing gray and malleable-iron bars in copper-oxide packing.

William Penn Statue Dominates City

TOWERING high over all surrounding buildings and visible for miles about the city is the statue of William Penn, Philadelphia's founder. This remarkable statue possesses peculiar interest to foundrymen. It is a magnificent example of ornamental casting work and was produced by the Tacony Iron & Metal Co. when that concern was headed by Francis Schumann, the first president of the American Foundrymen's association. Measuring 37 feet from pedestal to crown of hat, this gigantic figure of the city's Quaker founder is set 510 feet above the street level, surmounting the tower of the $25,000,000 city building. The photograph here reproduced was taken when the figure was on the ground preparatory to being raised to the top of the tower, in November, 1894.

It is expected that an unusual amount of interest will be attracted by the session devoted to industrial relations to be held in the Red room of the Bellevue-Stratford hotel Thursday morning. The training of men for foundry work will receive considerable attention, the subject being introduced in papers to be presented by C. C. Schoen and J. C. Wright, who have had experience in dealing with this problem as members of federal boards of investigation. C. D. Dyer, Jr., will present a paper on personnel problems of modern industry and John Calder will discuss the role of the foreman in the plan of industrial democracy. The report of the committee on safety, sanitation and fire prevention will be submitted by Victor T. Noonan, chairman of that committee and a paper entitled "Safety Appliances and Welfare Work in Foundries" will be presented by F. G. Bennett.

Two of the 15 technical papers on the program of the Institute of Metals division are scheduled for the opening professional session to be held at 2:30 p. m. Tuesday in the Ritz-Carlton hotel. David H. Browne and J. F. Thompson will present a paper on the properties of nickel. "Some Properties of and Applications of Rolled Zinc Strip and Drawn Zinc Rod" is the title of a paper prepared by C. H. Mathewson, C. S. Trewin and W. H. Finkeldey. At Wednesday morning's session C. P. Carr and H. F. Staley will present two papers dealing with zinc bronzes and the manufacture and electrical properties of manganin and constantin will be discussed in two papers by F. E. Bash. The subject of aluminum alloys will be discussed in four of the six papers scheduled for the Thursday morning session. The other papers to be presented at this session deal with the deterioration of nickel spark-plug terminals and the grain growth in alpha brass.

The Inter-Allied Foundrymen's exhibition to be held in the Philadelphia Commercial Museum will far surpass anything ever attempted by any organization in the United States. The 60,000 square feet of floor space available in this hall, although 43 per cent in excess of any previous exhibit, has proved inadequate for the requirement of the manufacturers desiring to display equipment. In view of the extraordinary demands for space, the manager of exhibits was obliged to restrict the amount of space allotted to each exhibitor. On Sept. 8, three weeks before the opening of the convention, more than 200 manufacturers of foundry, machine shop and metal working equipment had signed contracts for space in the building.

Times Have Changed

FRANCIS SCHUMANN

First president of the American Foundrymen's association and of its parent body, the Philadelphia Foundrymen's association.

WHEN the first national convention of the American Foundrymen's association was called to order by Francis Schumann on May 12, 1896, *the problems of the industry varied in a marked degree from those which confront the delegates to the* 1919 *sessions. The chemistry of iron was just beginning to be appreciated by foundrymen as a practical means for bettering their products; high-speed overhead traveling cranes, and compressed air were agencies as yet in their infancy, while molding machines were in the early stages of development. The accompanying program of the first convention furnishes an interesting sidelight on the trend of thought at that period.*

PROGRAM FOR THE FIRST MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION

"Chemistry of Iron, with Determinations and Their Value," by Charles James, M. E., of Henry Disston & Sons, Philadelphia, and W. C. Henderson, chemist, of Thomas Devlin & Co., Philadelphia.

"The Strength of Cast Iron, with Samples," by W. J. Keep, Detroit, Mich.

"Apprenticeships, Their Value and How to Make New Molders," by D. J. Matlack, of I. P. Morris Co.

"Foundry Cranes, the Different Power Used to Drive Them," accompanied by lantern slides, by A. E. Outerbridge, Jr., of Wm. Sellers & Co., Inc., Philadelphia.

"Acid Open Hearth vs. Basic Open Hearth and the Wahand-Legensel Bessemer Process," by Jos. Hartshorne, M. E., of Pottstown, Pa.

"The Air Compressor for Use in the Foundry," by C. W. Shields, of Ingersoll, Sergeant Drill Co., Easton, Pa.

"Cupolas and Cupola Practice Up to Date," by Dr. Edw. Kirk, Philadelphia.

"Entertainment of the Delegates," by Mr. John Birkinbine, M. E., of Philadelphia.

"Utility and Advancement of Green Dry and Loam Sand Molding," by Thomas D. West, Sharpsville, Pa.

"Gear Molding and Gear Molding Machines," by S. Grove, of Taylor, Wilson & Co., Pittsburgh, Pa.

"The Sand Blast for Cleaning Castings," by Fred C. Brooksbank, of Ward & Nash, Boston, Mass.

"Molding Machines and Their Appreciation," by Harris Tabor, of Tabor Mfg. Co., of Elizabeth, N. J.

The 1919 exhibition will be different in many respects from those of the past five years. Many manufacturers of foundry equipment who, because of the pressure of war, were not able to participate in recent exhibits, will be represented at this year's show. More than 80 exhibitors who were not represented at Milwaukee last year will display equipment at Philadelphia. This year's show will be marked by an unusually large number of working exhibits, especially those consisting of machine tools and molding machines. British made machine tools will be displayed this year for the first time and many American machinery manufacturers will exhibit tools which have never been shown before.

On account of the labor shortage caused by the enlistment of foundry and machine shop workers in the army and navy, labor-saving apparatus was prominent in last year's display. Although most of the men who entered federal service during the war have returned to their jobs, there still is a great shortage of workers, and the need for labor-saving equipment now is as great if not greater than during the war. As a result of this condition, foundrymen who visit Philadelphia will find a wide variety of foundry and shop appliances designed to minimize manual labor. The ending of hostilities also has permitted a greater number of dealers in foundry supplies to participate in this exhibit, and as a result, a great variety of core oils, molding sands, facings, chaplets, flasks, pattern plates, and other supplies will be in evidence. Manufacturers of fuel and iron will enter interesting exhibits this year, foundry grades of coke forming an important feature of these displays. Eight companies specializing in the design and construction of industrial buildings, foundries, foundry floors, etc., will maintain exhibits. The manufacturers of electrical apparatus, pneumatic tools and machinery, welding outfits, sand-blasting equipment, hoists and cranes, sand and metal handling devices and safety apparatus for foundry workers will be more extensively represented this year than at any previous show.

Philadelphia, perhaps more than any other city in the United States, abounds with points of historical interest and unusual opportunities for sightseeing. The local Philadelphia committee on entertainment has taken advantage of this fact and has arranged a number of pleasing events for ladies and gentlemen. A boat ride on the Delaware river has been planned for Tuesday afternoon. This will provide an opportunity to view a number of shipyards and large industrial plants, and at the end of the

trip the Hog Island shipyard will be inspected. Wednesday morning at 11 o'clock the ladies will be taken on an automobile trip through Fairmount park to Valley Forge where luncheon will be served. A golf tournament will be held Wednesday afternoon at the Whitemarsh Valley Golf club and at 8:15 p. m. a theater party will be given for ladies and gentlemen at Keith's. Thursday afternoon the ladies will be given an opportunity to visit Wanamaker's store, the plant of the Curtis Publishing Co., Independence hall, and other points of interest in the city. The annual banquet to which the ladies are invited will be held at 7 p. m. Thursday at the Bellevue-Stratford hotel, after which there will be dancing. Special arrangements will be made during the week for visiting foundrymen who desire to inspect industrial plants in Philadelphia or vicinity.

In the midst of the great preparations for the 1919 Inter-Allied Foundrymen's congress, it is interesting to turn back for a moment to the first convention in Philadelphia and to the beginning of the American Foundrymen's association.

It was in the latter part of 1890, that a few prominent foundrymen first met in Philadelphia to discuss problems of common interest connected with the conduct of their business. The idea which brought them together was the promotion of better fellowship among those engaged in the castings industry. It was felt that a mere speaking acquaintance would tend to lessen the evil of price cutting which was prevalent at that time. These early meetings brought into being the first feeble stirrings of the spirit that found expression later in the American Foundrymen's association. It must not be assumed that these informal affairs were regularly or fully attended. But the idea of a foundrymen's association slowly gathered force.

In July, 1891, an organization meeting was held in response to a call sent out by Howard Evans, then with the J. Emerick Co. Those who met together at that time formed the Philadelphia Foundrymen's association.

These and a few others formed the nucleus about which the Philadelphia association was built up. Most of them were identified prominently with the growth of the national organization and some few of them still are active along this line.

In 1896 the Philadelphia Foundrymen's association conceived the idea of a national organization formed of those engaged in the foundry industry throughout the country. The benefits derived from the local association were so apparent that these broad thinking men desired to bring within the influence of a similar association all those who were engaged in manufacturing castings. Accordingly a campaign was organized which was carried through largely by the efforts of certain individuals among whom were Francis Schumann and Howard Evans, president and secretary respectively of the Philadelphia organization and John A. Penton, editor and proprietor of THE FOUNDRY, which at that time was published in Detroit. The Western Foundrymen's association, which had been formed previously, took an active part in bringing about the first national convention. Thus the association was launched. In the general invitation which was sent broadcast to foundrymen the object of the gathering was set forth as follows:

"The object of this convention is to bring about a more friendly feeling among the foundrymen of this country and to present and discuss papers on interesting subjects and to encourage the formation of foundry associations in every part of the United States where it is possible to do so, believing in the end good results must follow, the idea being to advance the foundry business in every way."

The opening session of the first convention of the American Foundrymen's association was held in the old Manufacturer's club, Philadelphia, on May 12, 1896. In his keynote speech President Francis Schumann, head of the local association, pointed out that the delegates assembled represented an industry consisting of nearly 4000 separate establishments employing over 120,000 persons. These produced some 2,600,000 castings with a total disbursement for labor of $114,000,000 upon an aggregate invested capital of $115,000,000. He pointed out that the excessive, and in some cases artificial competition had brought a general movement toward combinations for the purpose of combating "unrestrained and dangerous rivalry." The downward course of prices had resulted in deterioration in the character of the products and undermining the finer sense of honor in the individuals so competing. The national organization was to correct these conditions.

It was felt at that time that a more friendly feeling between the men engaged in the same work would tend to more satisfactory prices through the reduction of reckless bidding and a better knowledge of costs of production. Even at this early date the need of standard physical tests for cast iron was strongly expressed. Labor difficulties, too, engaged the attention of the delegates. The question of convict labor was presented and informal conferences between delegates brought out plans to avoid strikes and lockouts and to enforce a universal apprenticeship system. It thus may be seen that the first steps of the organization were directed towards material and practical rather than technical problems. The transition and broadening of activities of the association since its inception will be appreciated by those who are familiar with the work of the organization at the present time.

At the initial session, Francis Schumann, Tacony Iron & Metal Co., Tacony, Philadelphia, was unanimously

Condensed Program

Monday, Sept. 29

10:00 A. M.—Registration, Philadelphia Commercial Museum.

10:00 A. M.—Opening of exhibition, Philadelphia Commercial Museum.

Tuesday, Sept. 30

10:00 A. M.—Joint session, American Foundrymen's association and Institute of Metals division of the American Institute of Mining and Metallurgical Engineers, ball room, Bellevue-Stratford hotel.

2:30 P. M.—Opening session, Institute of Metals division, American Institute of Mining and Metallurgical Engineers, Ritz-Carlton hotel.

Afternoon—Boat ride on the Delaware river, terminating with a visit to the Hog Island shipyard.

Wednesday, Oct. 1

10:00 A. M.—Professional session, American Foundrymen's association, ball room, Bellevue-Stratford hotel, for the discussion of general topics.

10:00 A. M.—Steel session, American Foundrymen's association, clover room, Bellevue-Stratford hotel.

10:00 A. M.—Professional session, Institute of Metals division of American Institute of Mining and Metallurgical Engineers, Ritz-Carlton hotel.

11:00 A. M.—Automobile trip for the ladies through Fairmount park to Valley Forge, where luncheon will be served.

2:00 P. M.—Golf tournament, Whitemarsh Valley Golf club.

8:00 P. M.—Theater party for ladies and gentlemen at Keith's.

Thursday, Oct. 2

10:00 A. M.—Gray iron session, American Foundrymen's association, ball room, Bellevue-Stratford hotel.

10:00 A. M.—Malleable iron session, American Foundrymen's association, clover room, Bellevue-Stratford hotel.

10:00 A. M.—Industrial relations session, American Foundrymen's association, red room, Bellevue-Stratford hotel.

10:00 A. M.—Professional session, Institute of Metals division, American Institute of Mining and Metallurgical Engineers, Ritz-Carlton hotel.

1:30 P. M.—For the ladies, a visit to Wanamaker's store, plant of the Curtis Publishing Co., Independence hall, and other points of interest in Philadelphia.

7:00 P. M.—Annual banquet, Bellevue-Stratford hotel, followed by dancing.

Friday, Oct. 3

10:00 A. M.—Professional session, American Foundrymen's association, ball room, Bellevue-Stratford hotel.

Program, American Foundrymen's Association

Monday, Sept. 29

10:00 A. M.—Registration, Philadelphia Commercial Museum.

10:00 A. M.—Opening of exhibition, Philadelphia Commercial Museum.

Tuesday, Sept. 30

10:00 A. M.—Joint opening session, American Foundrymen's association and Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, Ball room, Bellevue-Stratford hotel.

Address of welcome, by Thomas Devlin, Thomas Devlin Mfg. Co., Philadelphia.

Response to the address of welcome, by A. O. Backert, president of the American Foundrymen's association.

Report of secretary-treasurer, American Foundrymen's association, Inc.

Report of board of directors, American Foundrymen's association, Inc.

Annual address by A. O. Backert, president, American Foundrymen's association.

"Considerations Affecting Brass Melting in Gray Iron Shops," by Russell R. Clarke, Eagle Brass Foundry, Seattle, Wash.

"The Weeks Electric Rotating Furnace as Applied to the Brass Foundry Industry," by F. J. Ryan, American Metallurgical Corp., Philadelphia.

"The Need for Co-operative Research in Alloys," by H. E. Howe, National Research Council, Washington, D. C.

Report of the American Foundrymen's association committee on foundry costs, by J. Roy Tanner, chairman, Pittsburgh Valve Foundry & Construction Co., Pittsburgh.

"Publicity Work of Foundry Equipment Manufacturers' Association," by Franklin G. Smith, chairman, publicity committee, Foundry Equipment Manufacturers' association, Cleveland Osborn Mfg. Co., Cleveland.

Appointment of nominating committee and committee on resolutions.

2:00 P. M.—Boat ride on the Delaware river, terminating with a visit to the Hog Island shipyard.

Wednesday, Oct. 1

General Topics

10:00 A. M.—Professional session, American Foundrymen's Association, Ball room, Bellevue-Stratford hotel.

"Audible Signals in Foundries," by Prof. Vladimir Karapetoff, Ithaca, N. Y.

"How to Secure Best Results in Combining Hoisting Apparatus with Molding Machines," by W. C. Briggs, Shepard Electric Crane & Hoist Co., New York.

"Foundry Sand-Handling Equipment," by H. L. McKinnon, The C. O. Bartlett & Snow Co., Cleveland.

"Concrete Foundry Molding Floors," by H. H. Haley, American Foundry Equipment Co., New York.

"The Care of Foundry Equipment," by G. L. Grimes, Grimes Molding Machine Co., Detroit, Mich.

"Uniform Methods of Cost Accounting," by C. E. Knoeppel, C. E. Knoeppel & Co., New York.

Report of the nominating committee and election of directors of the American Foundrymen's association, Inc.

Steel Session

10:00 A. M.—Professional session, American Foundrymen's association, Cover room, Bellevue-Stratford hotel.

"Electric Versus Converter Steel," by John Howe Hall and G. R. Hanks, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

"Effect of Sulphur in Steel Castings," by Professor A. E. White, University of Michigan, Ann Arbor, Mich.

"Repairing Castings on Transport Northern Pacific," by Arthur F. Braid, Metal & Thermit Corp., New York.

"Comparison of Costs of Electric and Open Hearth Furnace Practice," by E. H. Ballard, West Lynn, Mass.

Report of the American Foundrymen's Association Committee on Steel Foundry Standards, by W. A. Janssen, chairman, American Steel Foundries, Chicago.

"Operation of the Acid Electric Furnace," by L. B. Lindemuth, Carney & Lindemuth, New York.

"Values of the Present Methods of Measuring the Temperature of Molten Steel," by F. W. Brooke, Electric Furnace Construction Co., Philadelphia.

Entertainment Features

11:00 A. M.—Automobile trip for the ladies through Fairmount park to Valley Forge, where luncheon will be served.

2:00 P. M.—Golf Tournament, Whitemarsh Valley Golf club.

8:00 P. M.—Theater party for ladies and gentlemen at Keith's.

Thursday, Oct. 2

Gray Iron Session

10:00 A. M.—Professional session, American Foundrymen's association, Ball room, Bellevue-Stratford hotel.

"The Elimination of Strains in Iron Castings," by C. J. Wiltshire, General Electric Co., Schenectady, N. Y.

"The Value of a Scrap Pile," by Henry Traphagen, Toledo Steel Castings Co., Toledo, O.

"The Electric Furnace as an Adjunct to the Cupola," by George K. Elliott, Lunkenheimer Co., Cincinnati.

Report of the American Foundrymen's Association Committee on General Specifications for Gray Iron Castings, Dr. Richard Moldenke, Watchung, N. J.

"Side Blow Converter in Iron Foundry," by George P. Fisher, Whiting Foundry Equipment Co., Harvey, Ill.

"The Testing of Clays for Foundry Use," by Homer F. Staley, Bureau of Standards, Washington.

"Cerium in Cast Iron," by Dr. Richard Moldenke, Watchung, N. J.

Malleable Session

10:00 A. M.—Professional session, American Foundrymen's association, Clover room, Bellevue-Stratford hotel.

"Burning Fuel Oil in an Air Furnace," by J. P. Pero, Missouri Malleable Iron Co., E. St. Louis, Ill.

"The Application of Powdered Coal to Malleable Annealing Furnaces," by Charles Longenecker, The Bonnot Co., Pittsburgh.

"Efficient Use of Pulverized Coal in Malleable Foundry Practice," by Milton W. Arrowood, Ground Coal Engineering Co., Chicago.

"Powdered Coal as a Fuel in the Foundry," by H. A. Grindle, Combustion Economy Corp., Chicago.

"Relation Between Machining Qualities of Malleable Castings and Physical Tests," by Edwin K. Smith and William Barr, Wisconsin Malleable Iron Co., Milwaukee.

"The Refining of Cupola Malleable in the Electric Furnace," by A. W. Merrick, General Electric Co., Schenectady, N. Y.

Report of the American Foundrymen's Association Committee on Specifications for Malleable Castings, by Enrique Touceda, chairman, Albany, N. Y.

"Some Needs of the Malleable Iron Industry," by W. P. Putnam, Detroit Testing Laboratory, Detroit.

"A Note on Britain's Experimental Foundry," by G. Ernest Wells, Edgar Allen & Co., Sheffield, England.

"Galvanizing Malleable Castings," by Prof. Enrique Touceda, Albany, N. Y.

"Effects of Annealing Gray and Malleable Iron Bars in Copper Oxide Packing," H. E. Diller, THE FOUNDRY, Cleveland.

Industrial Relations Session

10:00 A. M.—Professional session, American Foundrymen's association, Red room, Bellevue-Stratford hotel.

"Training Men for Foundry Work," by C. C. Schoen, U. S. Dept. of Labor, Stamford, Conn.

"Personnel Problems of Modern Industry," by C. D. Dyer Jr., Hunt & Dyer, Philadelphia.

"Industrial Democracy and The Foreman," by John Calder, Business Training Corp., New York.

Report of the American Foundrymen's Association Committee on Safety, Sanitation and Fire Protection, by Victor T. Noonan, U. S. Mutual Liability Insurance Co., Quincy, Mass.

"Vocational Training for Foundry Occupations," by J. C. Wright, Federal Board for Vocational Education, Washington.

Entertainment Features

1:30 P. M.—For the ladies, visit to Wanamaker's store, plant of the Curtis Publishing Co., Independence hall, and other points of interest.

7:00 P. M.—Annual banquet, Bellevue-Stratford hotel, followed by dancing.

Friday, Oct. 3

General Topics

10:00 A. M.—Professional session, American Foundrymen's association, Ball room, Bellevue-Stratford hotel.

"The Economical Control and Handling of Patterns in a Large Foundry," by W. D. Jones, Canton Steel Foundry Co., Canton, O.

"Progress in the Application of Electric Arc Welding," by Robert E. Kinkead, Lincoln Electric Co., Cleveland.

"A New Cutting Gas," by Professor Alfred S. Kinsey, Stevens Institute of Technology, Hoboken, N. J.

"Welding Castings of Different Metals and Different Sections," by George B. Malone, Bayonne Steel Casting Co., Bayonne, N. J.

Report of the American Foundrymen's Association Committee Advisory to the United States Bureau of Standards, by Dr. Richard Moldenke, Watchung, N. J.

Report of American Foundrymen's Association Committee on Promotion and Membership, by A. E. Howell, chairman, Nashville, Tenn.

"High Temperature Cement for Lining Cupolas, etc.," by W. S. Quigley, Quigley Furnace Specialties Co., New York.

Installation of officers.

Program, Institute of Metals Division, A. I. M. M. E.

Monday, Sept. 29

10:00 A. M.—Registration, Ritz Carlton hotel.

10:00 A. M.—Opening of exhibit, Philadelphia Commercial Museum.

7:00 P. M.—Meeting and dinner of the executive committee.

Tuesday, Sept. 30

10:00 A. M.—Joint opening session, American Foundrymen's association and Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, ball room, Bellevue-Stratford hotel. A. O. Backert, chairman, president American Foundrymen's association. (See American Foundrymen's program for details.)

2:30 P. M.—Professional session, Institute of Metals Division, Ritz-Carlton hotel.

Physical Properties of Nickel, by David H. Browne and J. F. Thompson.

Some properties and Applications of Rolled Zinc Strip and Drawn Zinc Rod, by C. H. Mathewson, C. S. Trewin and W. H. Finkeldey.

Afternoon—Boat ride on the Delaware river, terminating with a visit to the Hog Island shipyard.

Wednesday, Oct. 1

10:00 A. M.—Professional session, Institute of Metals Division, Ritz-Carlton hotel.

Five Foundry Tests of Zinc Bronzes, by C. P. Karr.

Influence of Heat Treatment on Gun Metal, by C. F. Smart.

Lead Zinc Bronzes, by H. F. Staley and C. P. Karr.

Manufacture and Electrical Properties of Manganin, by F. E. Bash.

Manufacture and Electrical Properties of Constantan, by F. E. Bash.

Tin Fusible Boiler Plug Manufacture and Testing, by L. J. Gurevich and J. S. Hromatko.

Simplification of Inverse-rate Method for Thermal Analysis, by P. D. Merica.

11:00 A. M.—Automobile trip for the ladies through Fairmount park to Valley Forge, where luncheon will be served.

2:00 P. M.—Golf tournament, Whitemarsh Valley Golf club.

8:00 P. M.—Theater party for ladies and gentlemen at Keith's.

Thursday, Oct. 2

10:00 A. M.—Professional session, Institute of Metals Division, Ritz-Carlton hotel.

Constitution and Metallography of Aluminum and Its Light Alloys with Copper and with Magnesium, by P. D. Merica, R. G. Waltenberg and J. R. Freeman Jr.

Heat Treatment and Constitution of Duralumin, by P. D. Merica, R. G. Waltenberg and H. Scott.

Heat Treatment of Aluminum Alloy Castings, by Zay Jeffries and W. A. Gibson.

Mechanical Properties and Resistance to Corrosion of Rolled Light Alloys of Aluminum and Magnesium with Copper, with Nickel and with Manganese, by P. D. Merica, R. G. Waltenberg and A. N. Finn.

Deterioration of Nickel Spark-plug Terminals in Service, by H. S. Rawdon and A. I. Krynitzky.

Grain Growth in Alpha Brass, by F. G. Smith.

1:30 P. M.—For the ladies, a visit to Wanamaker's store, plant of the Curtis Publishing Co., Independence hall, and other points of interest in Philadelphia.

7:00 p. m.—Annual banquet, Bellevue-Stratford hotel, followed by dancing.

chosen as chairman for the meetings to follow; while Howard Evans, J. W. Paxson & Co., Philadelphia, was elected temporary secretary.

Upon resolution presented by F. A. Riehle, Riehle Bros., Philadelphia, a committee of five was appointed to draw up a suitable constitution to govern the national association. The members of this committee were A. Sorge Jr., Chicago; R. Taylor, Pittsburgh; Frank A. Magee, Boston; J. Best, Montreal, and C. S. Bell, Hillsboro, Ohio.

The discussion of a suitable title for the organization brought out the statement that this was not to be a national association, because such a title might carry the intimation that membership was confined to the United States alone. The hope was expressed that a large number of foundrymen, experts in their line, who were located in Canada, would co-operate in the work of the association. The wisdom of this course has been fully vindicated.

An interesting sidelight on the shifting of public thought and the wide difference between the problems of 1896 and those which confront the foundryman today is furnished by a comparison of the program of the first convention and that which will engage attention at the forthcoming meeting on Sept. 29 to Oct. 3, 1919.

No trouble was experienced in 1896 in bringing the delegates to the meetings, and the discussions indicated the vital interest in the subjects which were discussed. The question of a proper constitution was threshed out with little difficulty and during the third day's session, officers were elected. Francis Schumann who had been president of the Philadelphia body since its formation was chosen as the first president of the American Foundrymen's association. Mr. Schumann was at that time in his fifty-second year. He had been an engineer with railroad experience. He served under General Meade in the Army of the Potomac during the Civil war and later had been superintendent and manager of a foundry and machine shop. Mr. Schumann had established the firm of Schumann & Lynch, Tacony, Philadelphia, which later became the Tacony Iron & Metal Co. Mr. Schumann served as president and general manager of this company.

Other Officers Appointed

Howard Evans, who was a partner in the firm of J. W. Paxson & Co., and had been in the foundry supply business all of his life, was chosen treasurer of the national organization. At the time of the convention he was secretary of the Philadelphia section and to his energy and ability is due much of the credit for the successful launching of the American Foundrymen's association. John A. Penton, editor and proprietor of THE FOUNDRY, was elected secretary.

Vice presidents were elected to lead the geographical sections as follows: New England, F. W. Gibby, Boston; Middle States, Robert G. Taylor, Pittsburgh; Southern States, Henry Clay Evans, Chattanooga; Central Western States, John M. Sweeney, Chicago; Southwestern States, W. S. Mosher, Dallas, Tex.; Pacific States, Irving Scott, San Francisco; Canada, Joseph Best, Montreal.

Eleven years later, in 1907, the American Foundrymen's association again turned to Philadelphia, its birthplace. The progress made in the interim is best stated in the words of the secretary at this time, Dr. Richard Moldenke:

"To the American Foundrymen's association may be directly ascribed the change in the purchase and sale of pig iron by analysis instead of by fracture. The metallurgists all over the world, working in iron and steel, were benefited by the standardizing bureau of the association ,originated and watched over by Thomas D. West; an ex-president of this body. The standardized drillings made by this bureau were admitted as authoritative in disputes concerning the correctness of analyses. The work of this bureau has been taken over by the United States government, the drillings of cast iron, duly standardized, being distributed by the bureau of standards at the present time. Standard methods of analyzing cast iron now are in the course of completion.

* * *

"Much work has been done on systems of apprenticeship, trade schools, cost systems, and instruction papers intended to help the foundryman educate younger workmen. In general, the work of the association has been directed toward awakening the great foundry industry to the need of more and better trained men to man the shops."

At this time Thomas Devlin was president of the Philadelphia body, and Howard Evans was still secretary. These two gentlemen, patriarchs in the industry and enrolled among

the founders of the national organization, again will meet the delegates in 1919 in the same capacity as president and secretary of the Philadelphia society. Practically every state in the union was represented at the second Philadelphia convention. There were 1391 registered and among this number were over 100 from Canada Over 65 manufacturers demonstrated their products at the supply show which was conducted in conjunction with the technical sessions in 1907.

At the close of the 1907 convention, Stanley G. Flagg Jr., Stanley G. Flagg & Co., Philadelphia, was elected president for the succeeding year. Dr Richard Moldenke, Watchung, N. J., was elected secretary-treasurer. Vice presidents elected were as follows: First district, C. J. Caley, New Britain, Conn.; second district, John W. Burr, Brooklyn; third district, H. E. Field, Pittsburgh; fourth district, J. H. Whiting, Chicago; fifth district, A. K. Beckwith, Dowagiac, Mich.; sixth district, T. W. Sheriffs, Milwaukee; seventh district, J. P. Golden, Columbus, Ga., and eighth district, L. L. Anthes, Toronto, Can.

Quaker City is Thriving Workshop

WINDING cow-paths followed by colonial settlers before the days of Benjamin Franklin in many cases later became the thoroughfares of thriving cities. Three generations ago pioneer prairie schooners followed by ox-trains and stage-coach lines charted the way for transcontinental railways. In more modern times the location of one successful drygoods store on the shady side of a street unfailingly brings others. Thus is the lead of precedent followed more rigidly in life than in courtrooms and like invariably attracts like in industrial ventures. In this way we account for the beginnings of the great iron, steel and foundry industries of Pennsylvania.

The early Quaker settlers who founded Philadelphia brought with them a knowledge of the processes of iron reduction, forging and casting. Native Pennsylvania ore soon suggested forges and later small furnaces to the settlers. The news of these attracted artisans, workers in metal, who came from England, Wales, Scotland, Germany and Sweden. This small industrial nucleus grew and increased until today a circle of 200 miles diameter, circumscribed about old Independence Hall as a center would embrace practically 40 per cent of the foundry business of America and almost 50 per cent of the hardware manufacturing of the world.

In the early days Philadelphia throve along metal working lines in the same proportion , that it does today. The Schuylkill and the Delaware offered wonderful facilities for transporting iron from the forges and furnaces further up-state. Originally the foundry industry was one and inseparable with the smelting of iron. In Swank's history of ironmaking in Pennsylvania is recorded the fact that the first stove-plate cast in this country, inscribed 1763, was made at the Colebrookdale furnace, near Philadelphia. By remarkable coincidence the first English cast-iron pots, kettles and other hollow ware by the use of sand molds was produced at the original Colebrookdale furnace in Shropshire, shortly after 1709. In 1789 there were said to have been 14 furnaces in Pennsylvania. These were small, as may be remarked from the fact that they produced only from 10 to 25 tons of pig iron and castings a week. These early iron works of Pennsylvania were for the most part within 40 miles of Philadelphia.

Pig iron in the early days sold at about $15 a ton. This was all cold blast, charcoal iron which developed a tensile strength up to 40,000 pounds per square inch. Castings brought twice as much as pig iron. During the Revolutionary war, Pennsylvania furnaces contributed a large share of the cannon and round shot which in most cases were cast in the sand molded directly in front of the furnaces.

THOMAS DEVLIN HOWARD EVANS

These gentlemen are among the patriarchs of the American Foundrymen's association. They will greet the delegates to the 1919 convention as they did those who attended the 1907 Philadelphia meeting. Mr. Devlin as president and Mr. Evans as secretary of the local foundrymen's association.

H. M. BOUGHER

HON. W. C. SPROUL

CLARKE P. POND

OTTO W. SCHAUM

GEORGE C. DAVIES

H. J. BOUGHER

GEO. F. PETTINOS

FRANK KRUG

C. R. SPARE

PHILADELPHIA'S LOCAL COMMITTEES HAVE BEEN ACTIVE FOR MONTHS PREPARING TO RECEIVE AND ENTERTAIN THE CITY'S GUESTS. THE CHAIRMEN OF THE VARIOUS COMMITTEES ARE REPRESENTATIVE MEN IN INDUSTRY

Philadelphia Convention Committees

Thomas Devlin, Thomas Devlin Mfg. Co., Philadelphia, chairman, ex officio of local committees
Howard Evans,, J. W. Paxton Co., Philadelphia, general secretary

Clearing House Committee

Howard M. Bongher, Chairman, J. W. Paxson Co.
Charles W. Asbury, Enterprise Mfg. Co.
H. J. Bannister, George Oldham & Son.
G. H. Clamer, Ajax Metal Co.
Stanley G. Flagg III, Stanley G. Flagg & Co.
D. P. Hopkins, U. S. Cast Iron Pipe & Foundry Co.
W. J. Johnson, Baldwin Locomotive Works.
George C. Matlack, William Cramp & Sons Ship & Engine Bldg. Co.
Staunton B. Peck, Link Belt Co.
Charles Suess, Westinghouse Elec. & Mfg. Co.
Walter Wood, R. D. Wood & Co.
Thomas Kaveny, Herman Pneumatic Machine Co.
Frank Hodson, Elec. Furnace Construction Co.
Silas M. Tomlinson, Frank Samuel.

The chairman of each of the following committees is also a member of this committee.

Finance Committee

C. P. Pond, chairman, David Lupton Sons Co.
C. T. Bird, Pangborn Corp.
Thomas M. Eynon Lynon-Evans Co.
J. H. Golding, Autocar Co.
W. W. Hearne, Matthew-Addy Co.
W. S. Hollowell, Harrison Safety Boiler Works.
Charles E. Muend, Haines, Jones & Cadbury Co.
J. Harry Mull, William Cramp & Sons Ship & Engine Bldg. Co.
J. T. King, Harbison & Walker Refract. Corp.
E. H. Redmond, Fairmount Foundry Co.
James S. Stirling, Hilles Jones Co.
George R. Sullivan, Rogers, Brown & Co.
Josiah Thompson, J. Thompson & Co.
C. K. West, General Electric Co.
W. J. Davis, McHatton Foundry Co.
S. E. Hadley, W. W. Sly Mfg. Co.

Publicity Committee

C. R. Spare, chairman, American Manganese Bronze Co.
H. A. Bomberger, Verilite Metals Co.
T. Harold Brown, E. E. Brown & Co.
J. W. Graham, Kitson Co.
Charles E. Pettinos, 802 Abbott building.
A. G. Warren, J. W. Paxson Co.
E. Arthur Bernstein, Bernstein Mfg. Co.
Charles E. McEvoy, H. A. May Foundry Co.
George M. Benkert, Fairmount Foundry Co.
H. W. Gledhill, Shepard Elec. Crane & Hoist Co.
H. L. Henszey, Carborundum Co.
H. J. Winters, T. P. Kelley & Co.
H. L. Haldeman, Pulaski Iron Works.
W. E. Wallace, Matlack Coal & Iron Corp.
M. R. Taggart.

Information Committee

George F. Pettinos, chairman.
Cyrus Borgner, Cyrus Borgner Co.
W. T. Dunning, Chester Steel Casting Co.
H. A. Ross, Ross-Tacony Crucible Steel Co.
Joseph E. Stutz, Thomas Devlin Mfg. Co.
R. C. Thum, Aetna Foundry Co.
W. G. Summers, Phoenix Iron Co.
W. J. Coane, Ajax Metal Co.
J. C. Childs, Austin Co.
J. H. Schwacke, William Sellers & Co.
T. C. Voorhees, Hickman, Williams & Co.

Golf Committee

Otto W. Schaum, chairman, Fletcher Works.
Howard Evans, J. W. Paxson Co.
J. R. Neilson, Ajax Metal Co.
L. U. Park, Park & Williams.
C. B. White, White & Bro.
H. F. Rebmann, American Engineering Co.

Visitation of Plants

George C. Davies, chairman, Pilling & Crane.
S. J. Creswell, S. J. Creswell Iron Works Co.
H. E. Mandell, Lindsay Chaplet Mfg. Co.
S. W. Mitchell, Philadelphia Roll & Machine Co.
Walter T. MacDonald, Fletcher Works, Inc.
C. H. Newcomb, Crocker Brothers.
F. J. Ryan, American Metallurgical Co.
George Somerhalder, Westinghouse Elec. & Mfg. Co.
H. B. Taylor, George F. Pettinos.
S. R. Vanderbeck, Whiting Foundry Equipment Co.
E. J. Decker, Paul S. Reeves & Son.
Thomas Holt, Camden Foundry Co.
George Fox, Philadelphia Sash Weight Works.
F. E. Schwarze, Cleveland Pneumatic Tool Co.
A. G. Hauck, Philadelphia Fire Brick Co.
A. F. Kempe, W. J. Rainey.

Reception and Hotel Committee

Hon. W. C. Sproul, governor state of Pennsylvania, honorary chairman.
Hon. Charles M. Schwab, vice chairman, Bethlehem Steel Co.
H. W. Brown, acting chairman, Tabor Mfg. Co.
G. H. Clamer, Ajax Metal Co.
George C. Davis, Chemist.
E. S. Dailey, William Adams Foundry Co.
Edwin Elliot, Midvale Steel & Ordnance Co.
J. S. Hibbs, J. W. Paxson Co.
W. S. Quigley, Quigley Furnace Specialty Co.
W. H. Ridgway, C. Ridgway & Sons Co.
W. J. Shennan, Foundry Dept. Bethlehem Steel Co.
E. M. Taggert, J. W. Paxson Co.
C. H. Wollaston, Lobdell Car Wheel Co.

Entertainment Committee

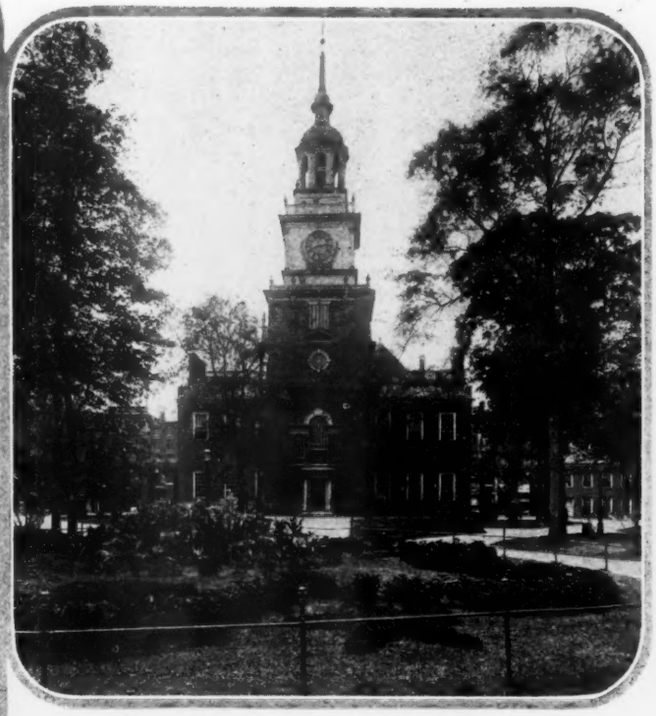
Frank Krug, chairman, White & Brother.
R. R. Belleville, Dixon Crucible Co.
C. D. Matthews, Camden Iron Works.
A. J. Myer, Abram Cox Stove Co.
F. J. Ryan, American Metallurgical Corp.
J. H. Sheeler, Sheeler-Hemsher Co.
C. M. Trivett, P. Isham.
Frank Overn, Federal Steel Foundry Co.
S. J. Beck, Pusey & Jones Co.

Committee on Foreign Visitors

A. O. Backert, chairman, Cleveland.
H. M. Bougher, J. W. Paxson Co., Philadelphia.
Stanley G. Flagg Jr., Stanley G. Flagg & Co., Philadelphia.
Thomas Devlin, Thomas Devlin Mfg. Co., Philadelphia.
H. D. Miles, Buffalo Foundry & Machine Co., Buffalo.
A. E. Howell, Phillips & Buttorff Mfg. Co., Nashville, Tenn.
R. A. Bull, Duquesne Steel Foundry Co., Coraopolis, Pa.
J. P. Pero, Missouri Malleable Iron Co., East St. Louis, Ill.
B. D. Fuller, Niagara Falls, N. Y.
L. L. Anthes, Ottawa, Can.

Loan of Automobiles

Herbert J. Bougher, chairman
C. M. Benkert
C. F. P. Buckwalter
Wilfred Lewis
Charles E. McEvoy
Wesley Caskey
Capt. J. L. Crawford
W. F. Sauter
H. A. White
Howard Evans
C. M. Trivett
G. H. Clamer
Otto W. Schaum
F. L. Webb
George F. Pettinos
M. L. Kirn
H. W. Brown
C. P. Pond
C. B. White
J. D. Johnson Jr.
J. H. Sheeler
H. M. Bougher
H. F. Rebmann
Thomas Devlin
R. C. Thum
Frank Hodson
F. B. Patt
W. H. Ridgway
J. H. Golding
A. G. Warren



OLD INDEPENDENCE HALL IS THE PATRIOTIC SHRINE OF AMERICA—IT HOUSES WITHIN ITS ENTRY WAY THE LIBERTY BELL, THE BEST LOVED RELIC OF HISTORY

PHILADELPHIA ABOUNDS IN HISTORIC LANDMARKS, AND STRUCTURES OF ARCHITECTURAL BEAUTY —ABOVE IS THE STATUE OF JOAN OF ARC IN FAIRMOUNT PARK—THE PENNSYLVANIA MUSEUM, SHOWN AT THE RIGHT, IS ALSO LOCATED IN THIS PARK—BELOW IS THE UNITED STATES MINT ON SPRING GARDEN ST.

Valley forge, where many of the members of the American Foundrymen's association will no doubt make a patriotic pilgrimage during the convention, is hallowed by the memory of the darkest hours of the Revolution. In this vicinity some of America's first steel is said to have been made. Here cast steel for use in saws was made as early as 1818. The clay for making the crucibles was imported from England. The influence of this early effort has carried through, and today Philadelphia possesses in the Henry Disston & Sons, Inc., one of the largest saw factories in the world.

Philadelphia formed the center for the greater part of the colonial iron business. Bar iron and castings which were made in the Schuylkill valley were transported down by boat to Philadelphia. The city itself furnished a fair market for the castings which were in use in pre-Revolutionary days. The field was extremely limited. The simplest of kettles and hollow-ware embraced the greater part of what would be considered castings for domestic use. Municipal castings also were unknown. The early waterworks system of Philadelphia was primitive and called for little from the foundry. All the mains were logs, bored through the center and jointed by a simple form of flanged connection. These connections were the only iron fittings used. Some

THE STEPHEN GIRARD COLLEGE IS ONE OF THE GREAT INSTITUTIONS OF LEARNING IN THE CITY—ITS MAIN BUILDING IS A MODEL OF THE GREEK PANTHENON

of these, which were used in the late years of the eighteenth century, may be seen today in the Franklin institute in Philadelphia.

The first mention of cast iron pipe used in the city refers to some laid in 1817. This was made in England. About this time, R. D. Wood & Co., Philadelphia, made some of the first cast pipe which was produced in this country. This was only 2 or 3 inches in diameter, and was molded horizontally in 9-foot lengths. Some of the earliest examples of pipe founding have been removed during late years and have been found to be in a remarkable state of preservation. It is interesting to note that the firm of R. D. Wood & Co., which was established soon after the Revolutionary war and which is said to have produced some of the first pipe molded in America still is an active concern, producing cast iron pipe and a varied line of equipment. The offices of this company are in Philadelphia and the main foundry is at Florence, N. J. The present executive of this company is a son of one of the founders of the institution.

Careless thought has attributed to the city of Philadelphia a somnolent character, slow, plodding and at times somewhat behind the procession in ideas. It is only necessary to point to a few concrete examples to refute this characterization. Franklin, states-

BROAD STREET, PHILADELPHIA'S MAIN THOROUGHFARE, IS 15 MILES LONG—IT IS INTERSECTED FOR ONE BLOCK BY THE CITY HALL, DOMINATED BY THE CLOCK TOWER AND STATUE OF WILLIAM PENN—AT THE LEFT IS THE LETITIA HOUSE, A HOME OF PHILADELPHIA'S FOUNDER BUILT IN 1682—BELOW IS THE WIDENER MEMORIAL SCHOOL

man, philosopher and inventive genius, dominated with his personality the last half of the eighteenth century and his mastery alone gave to Philadelphia the lead in political, social and scientific thought during that period. Even the foundry industry bears the touch of Franklin's master hand. He published in 1744 a pamphlet describing a newly invented stove or "Pennsylvania fireplace." This was in effect a cast covering for the front of a fireplace, without oven or chimney. The first stoves made in America are thought to have been cast by Christopher Sower of Germantown, near Philadelphia. Philadelphia's ascribed sluggishness and inertia again is challenged by a name which always is linked with that of the Quaker City, and is known through all the lands where steel rails have shortened time and space. Matthias W. Baldwin was a Philadelphia jeweler. Had the alleged lethargy of the community possessed him, his hallmark might have adorned a few odd pieces of plate preserved in vaults of some of Philadelphia's old families and hundreds of "Pershing" locomotives might have been built in Sheffield, Newcastle or in Birmingham, England. Mr. Baldwin formed a partnership in 1825 with David Mason, a machinists, to manufacture bookbinders' tools and cylinders for calico printing. An engine which was purchased to operate some machinery in the factory proved unsatisfactory and as engines were few and all were similar in design in those days, Mr. Baldwn designed and constructed one on his own ideas. This led to the manufacture of stationary engines and directed Mr. Baldwin's attention to the practicability of steam as a propelling power for traction purposes. In 1830 a few British-made locomotives of a primitive type had been imported, and one which was only partially successful had been built by the West Point Foundry, New York.

About this time, Franklin Peale, director of the Philadelphia Museum, requested Mr. Baldwin to build a miniature locomotive for exhibition purposes. Basing his design on published descriptions of locomotives that had taken part in the Rainhill competition of steam-propelled vehicles held in England, Mr. Baldwin, in April, 1831, completed a small locomotive which ran about a circular wooden track in the museum. This miniature was so successful that in the same year Mr. Baldwin received an order for a locomotive to operate upon the Philadelphia, Germantown & Norristown railroad, a 6-mile trunk line, operating horse-drawn cars for passenger traffic.

The entire locomotive when completed weighed about 5 tons. In the trial trip made Nov. 23, 1832, a speed of 28 miles per hour was attained, and it was predicted that a load of 30 tons could be drawn at an average speed of 40 miles per hour on a level road. This

A. O. BACKERT
President, American Foundrymen's association 1918-1919

locomotive, Old Ironsides, continued for some time a great attraction for the traveler who sought a new sensation. It occupied the place now being taken by the airplanes that are being taken about from place to place to afford rural dwellers short trial flights.

The Baldwin interests passed through numerous vicissitudes during the early years of locomotive building, but steadily maintained a place in the lead of advanced construction. The Civil war found the company prepared to aid to the fullest extent in supplying locomotives for government service. Similarly the outbreak of the Great War brought burdens which were handled admirably. The different types of locomotives which were constructed for all the belligerent nations during the war included the great total of over 5500 itemized as:

Broad gage steam locomotives	3246
Narrow gage steam locomotives	1146
Broad gage gasoline locomotives	20
Narrow gage gas'l'n locomotives	1139
Total	5551

The foundry capacity necessary for this great establishment has kept pace with the growth of the manufacturing plant. During 1906 a tract of 184 acres was purchased at Eddystone, Pa., about 12 miles from Philadelphia. Here extensive foundries and blacksmith shops were erected. Since 1907 extensive additions to ths plant have been erected from time to time. These include further foundry facilities, pattern shops, pattern storage building and erecting shops. All gray iron, malleable and brass castings are produced in the company's own foundries. All parts of locomotives with the exception of boiler and tank plates, chilled wheels, boiler tubes, and special patented appliances are made in the works of the Baldwin company from raw materials. The growth of railway transportation did much to bring Philadelphia to the front as a manufacturing city. It also did much to establish its precedence as a foundry center. The trackless pathways of the seven seas also have brought into being establishments which rival even the Baldwin plant. Along the Delaware is one of the oldest shipyards in the country. This is the William Cramp & Sons Ship & Engine Building Co. William Cramp commenced bulding ships in 1830, almost at the same time when Matthias W. Baldwin turned from jewelry to locomotives. The Cramp company was incorporated in 1872. The first man-o-war built in this plant was the NEW IRONSIDES, launched in 1862. From time to time, since that date, this yard has contributed its services to the government in the construction of fighting ships, and several foreight battleships were built previous to 1914. The Cramp yard has constructed over 400 vessels since its founding, and from an early date the gray iron, steel and nonferrous metal castings required have been produced in plants operated by the Cramp interests. The foundries of this company have furnished as high as 3,000,000 pounds of

iron, 2,000,000 pounds of steel and 1,000,000 pounds of bronze castings per month for use in vessels under construction in its own or other shipyards. The brass foundry is particularly interesting as the first to manufacture the Parson's bronze under patents owned in Great Britain. This foundry's work is fully described elsewhere in this issue. Practically all the castings used by the New York Shipbuilding Co., located at Camden, N. J., across the Delaware, are furnished by the Cramp foundries.

Ship and locomotive building have had a marked influence on the foundry industry of Philadelphia. William Sellers & Co., Inc., is one of the largest manufacturers in America of machine tools for locomotive and railway equipment construction and for shipyard use. It specializes in heavy horizontal boring machines for locomotive cylinders, car wheel boring and turning mills, plate and boiler drills, bending machines, hammers, lathes and slotting machines for locomotive frames. This company is one of the pioneers in metalworking in Philadelphia, and is particularly interesting for its large and splendidly equipped foundries. The present firm was started in Philadelphia in 1848 by Messrs. Bancroft and William Sellers. In 1853 the firm erected machine shops, forge shops, brass and iron foundries and pattern shops in a number of buildings which still are occupied by the company. The old foundry with its allied shops occupied about 8600 square feet. The death of Mr. Bancroft in 1855 resulted in William Sellers and John Sellers Jr. assuming control of the business. The firm built a new foundry to accommodate its growing requirements in 1883. This has been extended until now the space occupied by the various casting departments is over 57,000 square feet.

The foresight of the designers of the foundry built at that early date is attested by the fact that it still is in use, and the arrangement and equipment provided are regarded as thoroughly efficient for the class of work handled. The foundry built in 1883 originally was provided with power and hand jib cranes which were superseded in 1885 by overhead traveling cranes. These were indeed remarkable for their day, as previous to this time the slow-speed cranes available had been mere hoisting machines. Each Sellers' crane had two trolleys which served a floor space 80 feet wide across the foundry floor. They were the first high-speed traveling cranes in use, and were sufficiently novel to attract the attention of foundrymen who visited the first convention of the American Foundrymen's association in 1896.

The Sellers foundries at present do almost no outside work as the company's own requirements utilize over 8,600,000 pounds of castings annually.

W. A. JANSSEN
Vice President, American Foundrymen's association 1918-1919

So far only those foundries which serve large manufacturing establishments have been considered. These though larger individually constitute only a small portion of the foundry resources of Philadelphia and vicinity. The city leads the world in the production of hardware, including springs, locks, plumbing supplies, mechanics' and household tools. It produces over $40,000,000 worth of general hardware annually, and of this amount exports practically 40 per cent of all such commodities sent out of this country.

An old established house making general hardware, ship chandlery, fittings and jobbing castings is the Thomas Devlin Mfg. Co., headed by Thomas Devlin, who for years has been the president of the Philadelphia Foundrymen's association and was one of the founders of the national body. This company was started in 1865 immediately after the close of the Civil war. Hardware and meat choppers which were just invented formed the main products of the original company. Mr. Devlin who has been in the foundry business for over 65 years worked as a young man in one of the first malleable iron plants in America, the Philadelphia Hardware & Malleable Iron Co. In 1870 Mr. Devlin became a member of the firm which was known as Carr, Crawley & Devlin. Later Mr. Devlin and Louis J. McGrath started in the malleable fittings business, and in 1880 a new plant was constructed at another location in Philadelphia. In 1902 the Thomas Devlin Mfg. Co. was incorporated and a large plant was built at Burlington, N. J., where a full line of malleable fittings now are manufactured. The two Philadelphia plants still forming part of the Devlin company make various general hardware, meat choppers, lard presses, hot air registers, etc. When the foundrymen gathered in Philadelphia in 1896 they were advised to visit the stove foundries of the Abram Cox Stove Co., "presided over by A. C. Mott," who was one of those who founded the American Foundrymen's association. This plant still continues a point of special interest as one of the large stove factories of the country. The company was established over 72 years ago. Two foundries are operated, one in Lansdale, Pa., and the other, the original plant in Philadelphia. Every known apparatus for heating or cooking with coal or gas is made at these two factories. This is one of the largest of a number of stove foundries to be found in the vicinity of Philadelphia.

A distinctive and highly specialized class of foundry work is represented in the plant of the American Manganese Bronze Co., located in Holmesburg, a suburb of Philadelphia. This company makes castings, forgings, ingots, rods and sheets of bronze. It specializes in marine propeller wheels, but the varied demands of industry call for the production of

heavy hydraulic castings, turbine runners, valves, and gears at various times. Jobbing foundries handling brass, steel and iron are liberally represented in the city. A characteristic foundry of the latter class is the Girard Iron Works which has been in continuous operation since 1864. This plant produces from 10 to 12 tons per day of medium and light weight castings, particularly high grade machinery castings. The Aetna Foundry which operates the plant formerly owned by the Tioga Foundry Co. is a similar plant which produces about 20 tons per day of castings weighing from a few pounds up to 10 tons. Richard T. Thum is president of both these latter plants. The Enterprise Mfg. Co., which makes hardware specialties, has an interesting foundry which was established over 50 years ago. This plant produces about 25 to 35 tons of small castings per day. In 1914 Pennsylvania produced 51,422 knitting machines which is almost 40 per cent of the number produced annually in the United States. An example of this class of establishments is the Fletcher Works, successors to Schaum & Uhlinger. This company manufactures looms and textile machinery, and centrifugal machines for extracting liquids from raw or finished fabrics, hides, pulp, chemical salts, ore, and sand and also for reclaiming paint, oil and grease from turnings, used containers, rags and waste materials.

C. E. HOYT
Secretary-Treasurer, American Foundrymen's association 1918-1919

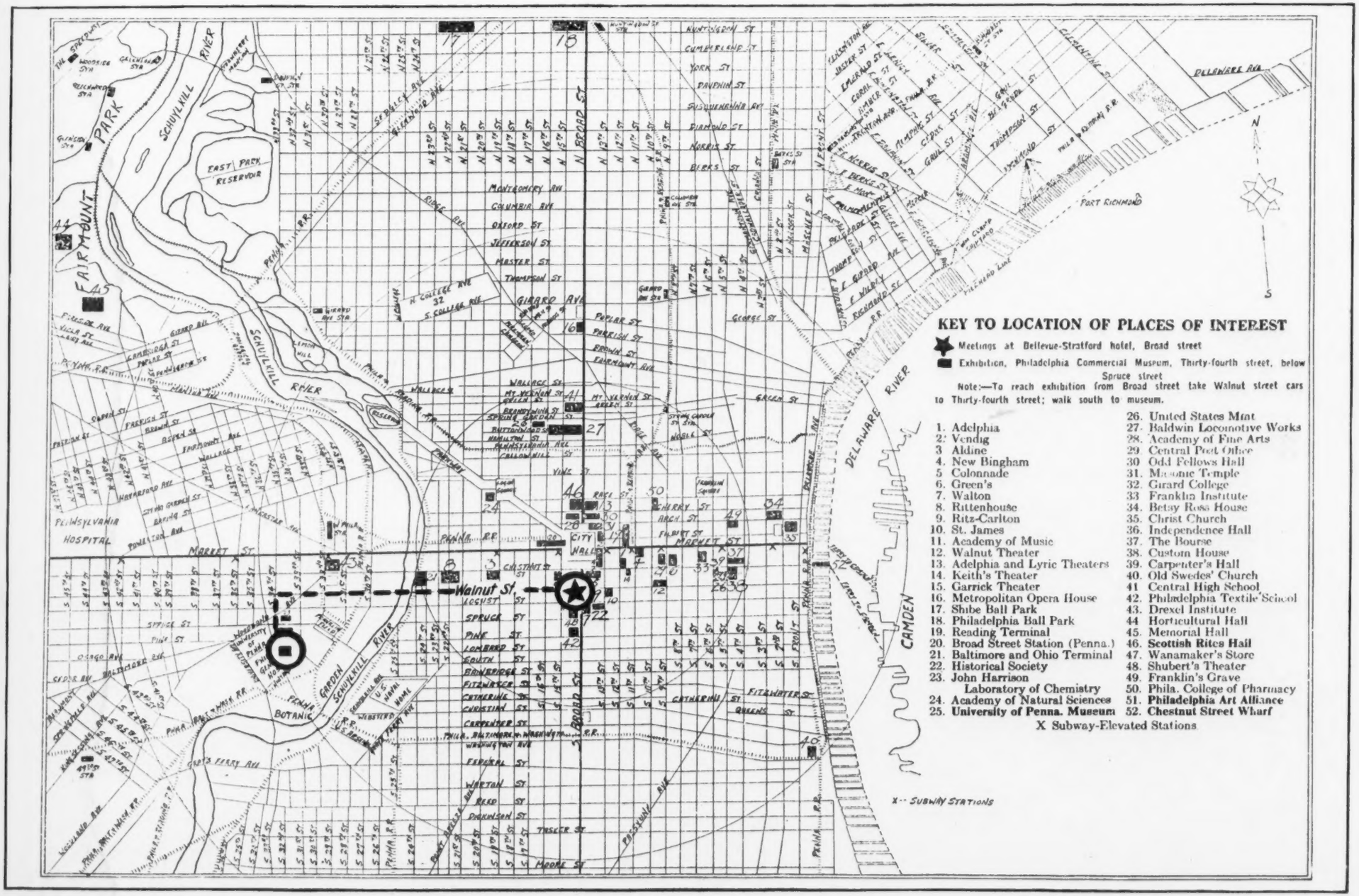
While it is probably not so well represented in the steel casting branches the Philadelphia community possesses some notable steel foundries. The Midvale Steel & Ordnance Co., which was particularly active during the war, produces in normal times over 2200 tons of acid and 6500 tons of basic open-hearth steel castings annually in addition to 9000 tons of iron castings used within the plant itself. A highly specialized branch of the industry is represented by the Ajax Metal Co., which was established in 1880. This company makes railway and machinery bearings and bearing metals. This was the first company excepting the Cramp interests to enter upon the commercial production of ingot manganese bronze. A complete plant for the recovery and refining of by-products known as copper-bearing material is operated and recently a new plant has been added to manufacture a type of electric furnace which has been used successfully in the company's own foundries. Obviously it is impossible to enumerate all the 133 foundries of Philadelphia proper. The city ranks third in the number of casting plants and probably exceeds all other American cities in the tonnage of castings produced. Furthermore, it is the hub of a great industrial district including other important foundry centers, such as Camden, Chester, Burlington, Lansdale and Pottstown. Foundrymen who visit the Inter-Allied Foundrymen's convention and exhibition will have an opportuntiy to visit and inspect some of the most modern and efficient plants known for the melting and casting of metals. Perhaps no other community offers more varied and highly specialized classes of foundry work than may be seen in Philadelphia or within a few hours ride from the city.

How to Find Way in Convention City

OWING to the fact that the professional sessions of the American Foundrymen's association and the Institute of Metals division of the Institute of Mining and Metallurgical Engineers, and the exhibition of foundry and shop equipment are to be held in widely separated buildings, the visiting foundrymen who are not familiar with the layout of Philadelphia, are advised to study the map on the opposite page. The Bellevue-Stratford hotel, where the joint session of the two organizations will be held Tuesday morning and where all other sessions of the American Foundrymen's association will be held, is situated at the southwest corner of the intersection of Broad and Walnut streets. The Ritz-Carlton hotel, where all sessions of the Institute of Metals division, with the exception of the joint session already mentioned, will be held, is on the southeast corner of the same intersection directly opposite the Bellevue-Stratford hotel.

The registration headquarters and the exhibition of foundry and shop equipment will be in the Philadelphia Commercial Museum on South Thirty-fourth street below Spruce street. To reach this building from the corner of Broad and Walnut streets, take a westbound No. 13 car on Walnut street to Thirty-fourth street and Woodland avenue. Walk south to the Philadelphia Commercial Museum. To reach the Museum building from the subway station at Thirteenth street and Juniper street, take subway-surface cars bearing numbers 11, 34 or 37 to Thirty-fourth street and Woodland avenue and walk south.

The Bellevue-Stratford and the Ritz-Carlton hotels are within easy walking distance of the city hall, the Pennsylvania railroad Broad street station and the Reading terminal, all of which are near the intersection of Broad and Market streets. All of the important hotels, as well as a large number of points of historical interests are indicated on the map.



MAP SHOWING PRINCIPAL POINTS OF INTEREST IN PHILADELPHIA—THE BELLEVUE-STRATFORD HOTEL AND COMMERCIAL MUSEUM ARE INDICATED BY THE CIRCLES

What You Will See at Foundry Show

Improvements in Foundry and Machine Shop Equipment Will be Reflected in Exhibits — 1919 Exhibition Will Surpass Previous Shows in Amount of Equipment Displayed and Number of Manufacturers Participating

ABRASIVE CO., Philadelphia.—This company will exhibit abrasive wheels, bricks and sticks. Grinding wheels of a carbide of silicon abrasive and wheels of an aluminous abrasive will be shown. Basic materials of interest to foundrymen will be exhibited; represented by J. H. Byers and R. R. Stagmer.

ACHESON GRAPHITE CO., Niagara Falls, N. Y.—This exhibit will consist of threaded electric furnace products including skimmers' and cutting and welding electrodes; represented by Acheson Smith, Lyman C. Judson and Atwood Boatman.

AIR REDUCTION SALES CO., New York.—A complete line of welding and cutting apparatus, including oxygen and acetylene, and acetylene generators, will be exhibited; represented by E. L. Mills, A. S. Kinsey, E. M. Sexton, L. A. Sholes, A. R. Ludlow, A. D. Frost, W. P. Roberts, H. F. Weldin, D. Sinclair, B. N. Law and G. Walker.

AJAX METAL CO., Philalelphia.—This company will exhibit an Ajax-Wyatt electric furnace and a group of yellow brass ingots made in this furnace. The ingots have a depression on each side so that tongs will grip them securely. A series of ingots made to different formulas and a variety of castings made from similar ingots will be displayed. Babbitt metals of all kinds will be shown; represented by G. H. Clamer, Frank M. Willeson, A. MacDougall, Louis E. Purnell, John G. Miller, J. M. Graham, S. E. McClure, J. C. Brightbill, C. E. Hopkins, James R. Wyatt and William J. Coane.

AMERICAN GUM PRODUCTS CO., New York.—Cores made with the binder manufactured by this company and castings produced by the use of these cores will be exhibited; represented by Gordon I. Lindsay, W. Edward Baird, M. F. Coughlin, C. F. Witters and F. B. Thomas.

AMERICAN KRON SCALE CO., New York.—The automatic springless dial scale for foundries made by this company will be demonstrated; represented by G. H. Harper, Arnold Peterson and J. J. Kelly.

AMERICAN MANGANESE BRONZE CO., Phiadelphia—A 100,000-pound capacity electrically driven Olsen testing machine will be shown in operation. Exhibitors are invited to bring test pieces to have them tested free of charge. The company also will exhibit manganese bronze ingots and intricate castings made from these ingots; represented by C. R. Spare, T. H. Addie, C. E. Schley and C. J. Bower.

AMERICAN OIL & SUPPLY CO., Newark, N. J.—Cores made with the core oil manufactured by this company will be exhibited; represented by E. F. Hoffmann, W. H. Fitzpatrick and A. E. Jones.

AMERICAN TOOL WORKS CO., Cincinnati.—Three radial drills, a shaper, two lathes and a planer will be exhibited. (See Vandyck Churchill Co.); represented by J. C. Hussey, Robert S. Alter, H. W. Schatz, F. L. Stubenroth and C. R. Connors.

AMERICAN WOOD WORKING MACHINERY CO., Rochester, N. Y.—Wood working machines for pattern making will be exhibited; represented by R. T. Martin.

ARCADE MFG. CO., Freeport, Ill.—Various types of the molding machines manufactured by this company, including the hand-operated pattern, the air-operated and the jolt machines will be exhibited. The company will also exhibit one type of air squeezer, a combined jolt and squeezer and four different sizes of core jolters, a jarring machine and a pouring device; represented by E. H. Morgan, Charles Morgan, L. L. Munn, Henry Tscherning, R. E. Turnbull, August Christen, G. D. Wolfley and Mentor Wheat.

ARMSTRONG CORK & INSULATION CO., Pittsburgh.—Insulating materials, including insulating brick for furnaces, core ovens, boiler settings and other high temperature equipment; covering for steam lines, feed water heaters, tank, etc.; cork covering for refrigerated drinking water systems in mills, factories and industrial establishments; corkboard insulation for cold storage and constant temperature rooms, and tile for floors in offices, residences, etc., will be exhibited.

ARROW FORGING & TOOL WORKS, Chicago.—Chisels particularly designed for cleaning castings and various tools used in shipyards and machine shops will be displayed; represented by L. G. Groessl, Benedict, and H. E. Pollard.

ASBURY GRAPHITE WORKS, Asbury, N. J.—The booth occupied by this company will be fitted up as a rest room. Samples of refined graphites and crude graphite from various localities and countries, will be shown; represented by H. M. Riddle Sr., H. M. Riddle Jr. and E. H. Thompson.

ATKINS, E. C., & CO., Indianapolis.—Metal cutting band saw machines, hack saw blades, hack saw frames, metal cutting circular saws and pattern plates will be exhibited; represented by T. H. Endicott, C. F. Neth, Edward Norvel and T. A. Carroll.

AUDUBON WIRE CLOTH CO., Audubon, N. J.—This company proposes to illustrate in detail the construction of foundry riddles, various grades of wire cloth for foundry use, screening and other wire products; represented by Robert T. Korb, William H. Egee and John D. Heins.

AUSTIN CO., Cleveland.—This company will exhibit models, drawings, photographs and literature on standard buildings. Information regarding foundry and steel plant service afforded by this company will be available. The models of buildings will be large enough to show the method of construction, relative sizes and arrangement of foundry equipment; represented by Benton Hopkins, G. A. Dodge, L. D. Stauffer, J. C. Childs, W. L. Bailey and O. D. Conover.

BARRETT CO., Chicago.—Core compounds and facings will be exhibited. The booth will be fitted up as a rest room; represented by W. M. Wilson.

BARTLEY, JONATHAN, CRUCIBLE CO., Trenton, N. J.—The booth occupied by this company will be fitted up as a rest room to which foundrymen are invited; represented by S. H. Dougherty, James W. Tighe, F. P. Welton, Lee T. Ward, M. H. Fike and Lewis H. Lawton Jr.

BERKSHIRE MFG. CO., Cleveland.—Squeezer molding machines of the air and hand operated types, vibrators, snap flasks and pattern equipment will be exhibited by this company; represented by W. D. Fraser and G. L. Cannon.

BESLY, CHAS. H., & CO., Chicago.—Disc and ring wheel, single and double spindle grinders will be demonstrated. A vertical spindle grinder, particularly adapted for foundry work for grinding flasks, will be shown. A patternmaker's disc grinder also will be exhibited under power; represented by E. P. Welles and C. A. Knill.

BIRKENSTEIN, S., & SONS, Chicago.—This company will exhibit nonferrous metals including ingot brass, ingot bronze, ingot copper, pig tin, pig lead, aluminum, manganese bronze, solder, babbitt, phosphor copper and phosphor tin. Castings made from these products also will be shown; represented by H. Birkenstein, C. Raphael, M. Isaacson, E. Schwab, M. Strauss, N. A. Goldman, N. W. Slohm, H. Gildstine, C. Shamroth, J. W. Long, M. Schero and L. Kahan.

BLACK DIAMOND SAW & MACHINE CO., Natick, Mass.—A combined band saw filing and setting machine for setting and filing both wood and metal cutting band saws; a circular saw filing machine; a beveled tooth circular filing machine for wood-cutting circular saws; a brazing outfit for brazing narrow band saws, both wood and metals, and a speeial metal cutting band saw for sawing brass, bronze and aluminum, will be shown; represented by Walter B. Ambler, Edward Gordon and Strand and Anderson.

BLYSTONE MFG. CO., Cambridge Springs, Pa.—A 7-cubic foot motor driven core sand mixer equipped with a revolving screen will be shown in operation; represented by Luther G. Conroe.

BOOTH-HALL CO., Chicago.—Electric furnace

BORGNER, CYRUS, CO., Philadelphia.—Samples of refractories for use in foundries will be exhibited; represented by George H. Dickel Jr.

BRASS WORLD PUBLISHING CO., New York.—The booth occupied by this company will be fitted out as a rest room; represented by G. A. Tanner, C. N. Manfred, William F. Carns, George A. Jones, C. H. E. Redding.

BROWN INSTRUMENT CO., Philadelphia.—This company will exhibit a complete line of pyrometers, recording thermometers, recording pressure gages, recording tachometers, draft gages, etc. An attempt will be made in this exhibit to show by demonstration the necessity of giving considerable study to the question of core drying; represented by J. P. Goheen, C. C. McDermott, L. M. Morley, J. L. Hacker and A. H. Edwards.

BROWNING, VICTOR R., & CO., Cleveland.—Two half-ton electric hoists of the type developed by this company will be exhibited; represented by Sheldon M. Hird, C. R. Rudinger and Harry H. Green.

BUCH FOUNDRY EQUIPMENT CO., York, Pa.—This company will exhibit corrugated steel molding flasks, aluminum flasks, pattern frames, adjustable jackets, adjustable steel bars and electrically and air operated jar, squeeze, rollover and pattern draw molding machines; represented by R. S. Buch and D. C. Coble.

BULLARD MACHINE TOOL CO., Bridgeport, Conn.—This company will exhibit an 8-inch automatic multiple vertical boring mill in operation; represented by S. H. Bullard, F. B. Smith, J. W. Bray, John Beirne, Frank E. Hatch Jr. and J. H. Van Yorx.

CARBORUNDUM CO., Niagara Falls, N. Y.—Departing somewhat from its usual exhibit, the company this year will feature refractories. A Gilbert & Parker furnace equipped with an entire lining of carborundum refractory material will be operated during the convention. Seven different refractory cements and other forms of refractories, including brick will be exhibited and demonstrated. As usual, abrasive materials for use in foundries will be shown; represented by C. E. Hawke, H. E. Kerwin, O. C. Dobson, W. L. Meck, H. G. Kretchmar and G. T. Estabrook.

CHAMPION FOUNDRY & MACHINE CO., Chicago.—A 16-inch jolt rollover molding machine fitted with a pattern and operated as a molding machine, and a similar machine fitted with a core box and operated as a core machine will be exhibited. An electrically operated sand riddle will also be shown in operation; represented by T. J. Magnuson, H. O. Magnuson and A. Magnuson.

CHASE, FRANK, D., Inc., Chicago.—This exhibit will consist of photographs and descriptions of foundries designed and built by this company; represented by Frank D. Chase, Morris W. Lee, W. H. Lenish, A. A. Wickland, C. B. Teter.

CHESAPEAKE IRON WORKS, Baltimore, Md.—The exhibit will show the features of the electric traveling crane manufactured by this company and illustrate the character of the great variety of steel structures and bridges that it has built and erected in the United States.

CHICAGO PNEUMATIC TOOL CO., Chicago.—A 14 x 9 x 14-inch air compressor will be operated by this company. It also will exhibit chipping and riveting hammers of all sizes, air and electric drills, pneumatic and electric grinders, sand rammers for bench and floor work, pneumatic geared and cylinder hoists, air hose, hose couplings, and miscellaneous

accessories; represented by W. P. Pressinger, A. C. Andresen, A. M. Brown, Nelson B. Gatch, R. F. Eissler, T. G. Smallwood, Ross Watson and T. G. Slingman.

CINCINNATI PULLEY MACHINERY CO., Cincinnati.—Representative sizes and styles of drilling machines manufactured by this company, including machines particularly designed for speeds as high as 12,000 revolutions per minute will be exhibited. Three sizes of sensitive machines, an automatic drilling machine, and machines equipped with built-in tapping attachments will also be shown; represented by J. G. Hey, J. F. Mirrielees and D. A. Patterson.

CLARK, CHARLES J., Chicago.—Blast volume meters and other instruments will be exhibited; represented by Charles J. Clark.

CLEVELAND OSBORN MFG. CO., Cleveland.—Molding machines will be exhibited, including direct draw roll over jolt machines, combination jolt stripper squeezer machines, plain air squeezers, combination jolt squeezers, hand roll over machines and core jolt machines; represented by J. C. Alberts, H. R. Atwater, E. J. Byerlein, E. T. Doddridge, H. E. Deakins, R. E. Kiefer, E. W. Jacobi and F. T. Spikerman.

CLEVELAND PNEUMATIC TOOL CO., Cleveland.—Pneumatic tools and accessories including riveting and chipping hammers; air drills; foundry rammers in two sizes, for floor bench and core work; portable emery grinders in two sizes for use in steel, gray iron and aluminum work; air hose couplings in sizes from ¼ to 1¼-inch; pressure seated air valves, and air hose fittings will be exhibited. The foundry tools will be in operation during the convention; represented by H. S. Covey, Arthur Scott, H. C. Newton, Charles Garner, G. Gregory, F. E. Schwarze and Capt. Frank H. Burr.

CLIPPER BELT LACER CO., Grand Rapids, Mich.—Belt lacers, belt hooks, and twisted rawhide and composition pins used with them will be exhibited. The belt lacer which is operated by hand, will be demonstrated; represented by William F. Kall.

COALE, THOS. E., LUMBER CO., Philadelphia.—Pattern lumber including Michigan soft cork white pine and California sugar pine will be exhibited; represented by Thomas E. Coale and A. Warren Anderson.

COLLIERIES SUPPLY & EQUIPMENT CO., Buffalo.

COMBINED SUPPLY & EQUIPMENT CO., Buffalo.—The chaplets and skim gates manufactured by this company will be exhibited; represented by Stephen LeViness Jr. and C. L. Jackson.

COMBUSTION ECONOMY CORP., Chicago.—A new design of powdered coal feeding and burning equipment equipped with an air-tight rotary air gate, a variable speed direct connected gear case with speeds marked to conform with the operation of the air gate, and a powdered coal carburetor will be displayed. This equipment has a maximum capacity of 75 pounds of coal per minute; represented by George Furman and A. J. Grindle.

CORN PRODUCTS REFINING CO., New York.—The making of cores with the core binder manufactured by this company will be demonstrated. A collection of cores made in this manner will be exhibited; represented by S. B. Krantz, J. A. Oates, F. G. Faller Jr., A. H. Kreischer, D. T. McGrory and J. M. Remmes.

CURTIS PNEUMATIC MACHINERY CO., St. Louis.—This company will have an operating exhibit consisting of an overhead pneumatic crane with air hoist, an electrically driven double cylinder air compressor, a bracketed jib crane, single I-beam trolleys and air hoists. All equipment will be operating under actual foundry and machine shop conditions; represented by Joseph Macksey and C. C. Main.

DAILY IRON TRADE AND METAL MARKET REPORT, Cleveland.—This booth will be fitted up as a rest room for visitors where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, H. Cole Estep, G. O. Hays, E. L. Shaner, H. E. Diller, D. M. Avey, Pat Dwyer, Charles Vickers, J. F. Ahrens, F. V. Cole, H. O. Taylor and Paul R. Fisher.

WANGELIN, WALTER H., & CO., St. Louis.—A calculator by which mixtures of iron may be rapidly figured will be exhibited; represented by Walter H. Wangelin.

DAVENPORT MACHINE & FOUNDRY CO., Davenport, Iowa.—Molding machines, including a combination jolt roll over pattern draw machine; a 30 x 30-inch jolt stripper and a jolt squeezer will be exhibited; represented by J. T. Anderson, A. V. Magnuson, A. Ziebarth, William Hetzel and Carl Falk.

DAVIS-BOURNONVILLE CO., Jersey City, N. J.—Oxyacetylene welding and cutting apparatus, including stationary and portable equipment, acetylene pressure generators, torches, regulators, etc., and recent developments in cutting and welding machines will be exhibited; represented by W. W. Barnes and H. H. Dyar.

DEBEVOISE-ANDERSON CO., New York.—The exhibit will consist of samples of foundry, furnace and crushed coke; coke and charcoal iron; iron ore; iron ore nodules; fluor spar; ganister; limestone, calcite and dolomite; represented by N. Anderson, P. Debevoise, C. K. Sutton, P. Brooks and C. A. Wyatt.

DINGS MAGNETIC SEPARATOR CO., Milwaukee.—Three of the standard foundry type separators made by this company, including a 12 x 18-inch complete pulley separator, and all equipped with motors for self contained drive, will be exhibited; represented by E. S. Hirschberg and R. A. Manegold.

DISSTON, HENRY, & SONS, Philadelphia.—This company will exhibit a large metal cutting machine in operation. Various types of saws for cutting several kinds of metal will be displayed; represented by W. R. Kendall, Joseph Dorrington, R. B. Mackenzie, R. H. Harris and Messrs. Paul, Dorsey and Bean.

DIXON, JOSEPH, CRUCIBLE CO., Jersey City, N. J.—Various sizes of standard crucibles, covers, scorifiers and phosphorizers will be shown; represented by H. C. Sorenson, R. R. Belleville, J. A. Condit, C. A. Shaw, R. H. Brinkerhoff, R. F. Leonard and J. Moses.

ELECTRIC FURNACE CO., Alliance, O.—Castings produced in various foundries by means of the electric furnaces made by this company will be shown. Two moving picture reels of installations, one showing brass melting equipment and another showing heat-treating furnaces, will be displayed in the booth occupied by this company; represented by R. F. Benzinger and D. D. Miller.

ELECTRIC FURNACE CONSTRUCTION CO., Philadelphia.—The booth occupied by this company will be fitted up as a rest room and office, and pamphlets, photographs and possibly samples of steel produced in Greaves-Etchells electric furnaces, may be shown; represented by Frank Hodson, F. W. Brooke, H. H. Twose and Neil Neville.

EMMERT MFG. CO., Waynesboro, Pa.—A drawing instrument, adjustable drawing board equipment and universal bench vises for wood and metal workers will be exhibited. Oscillating and disc sanders, saw filing and setting machine, drill chuck, steel clamps, grinders and bench planer, a band saw, a bench saw and several other wood working tools will be shown; represented by Edward Gordon, H. S. Kuhn, A. G. Blazier, D. C. Kane and J. Lapides.

FEDERAL FOUNDRY SUPPLY CO., Cleveland.—A new molding machine designed by John T. Stoney, superintendent at the Ferro Foundry & Machine Co., Cleveland, will be exhibited. With this machine, it is claimed, that four men can mold at one time. A number of machines, including plain jolts, combination jolt and squeeze and plain squeezer machines and air and electrically operated vibrators and snap flasks will be shown; represented by Ralph Ditty, Ellsworth Kaye, W. J. Smith, John Bayer and H. W. Trevett.

FOREIGN CRUCIBLE CORP., New York.—French graphite crucibles which can be made in any of the standard American sizes for brass and steel melting will be exhibited; represented by R. N. Stevens and L. J. Rebele.

FOUNDRY, THE, Cleveland.—This booth will be fitted up as a rest room for visitors where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, H. Cole Estep, G. O. Hays, E. L. Shaner, H. E. Diller, D. M. Avey, Pat Dwyer, Charles Vickers, J. F. Ahrens, F. V. Cole, H. O. Taylor and Paul R. Fisher.

FOUNDRY APPLIANCE CO., Newark, N. J.—The cope handling device manufactured by this company will be exhibited. This device is an attachment to a squeezer type molding machine which handles the cope and draws the pattern; represented by J. N. Frantz.

FOUNDRY EQUIPMENT CO., Cleveland.—Various types of ovens for cores and molds will be shown; represented by F. A. Coleman and C. A. Barnett.

FOUNDRY MANGANESE CO., Philadelphia.—This exhibit will consist of ground and lump ferromanganese and silicon, and ground chrome ore; represented by Horace Morgan.

GARDNER MACHINE CO., Beloit, Wis.—This company will exhibit new roll grinders, representative single spindle disc grinders, heavy duty disc grinders and a 53-inch vertical spindle disc grinder; represented by W. B. Leshman, W. L. Townsend, H. C. Steinbuck, A. A. Swinnerton and F. M. Risler.

GENERAL ELECTRIC CO., Schenectady, N. Y.—An arc welding set will be exhibited; also a cupola blower compressor driven by a 30-horsepower motor. The compressor has a capacity of 4500 cubic feet per minute with one pound pressure when operating at 3450 revolutions per minute; represented by J. M. Hollister, B. L. Spain, B. C. Tracy, L. W. Shugg, Edmond Vonseteeg and C. K. West.

GEOMETRIC TOOL CO., New Haven, Conn.—Threading tools with examples of work performed by them will be exhibited at booth of Vandyck-Churchill Co.; represented by C. F. White.

GORDON, ROBERT, INC., Chicago.—A mechanical hot blast heater will be exhibited. This heater has a capacity to circulate 10,000 cubic feet of air per minute at approximately 200 degrees Fahr. The heater will be in operation and a special casing will be designed for this exhibition so that the heater may be opened to show internal construction; represented by T. H. Monaghan, H. H. Engle and R. M. Zimmerman.

GRACETON COKE CO., Graceton, Indiana Co., Pa.—Foundry coke and castings and photographs of castings manufactured by users of the coke made by this company will be exhibited. Views of the plant will be displayed; represented by C. M. Lyngle.

GRAND RAPIDS GRINDING MACHINE CO., Grand Rapids, Mich.—The exhibit will consist of grinding machinery, including two types of universal cutter, reamer and tool grinders; five types of drill grinders, two of which will be operated, and new grinders for castings; represented by Owen Livingston and J. Cekoning.

GREAT WESTERN MFG. CO., Leavenworth, Kans.—Three types of gyratory foundry riddles, and renewable bottom sieves will be shown by this company; represented by F. A. Pickett and George W. Combs.

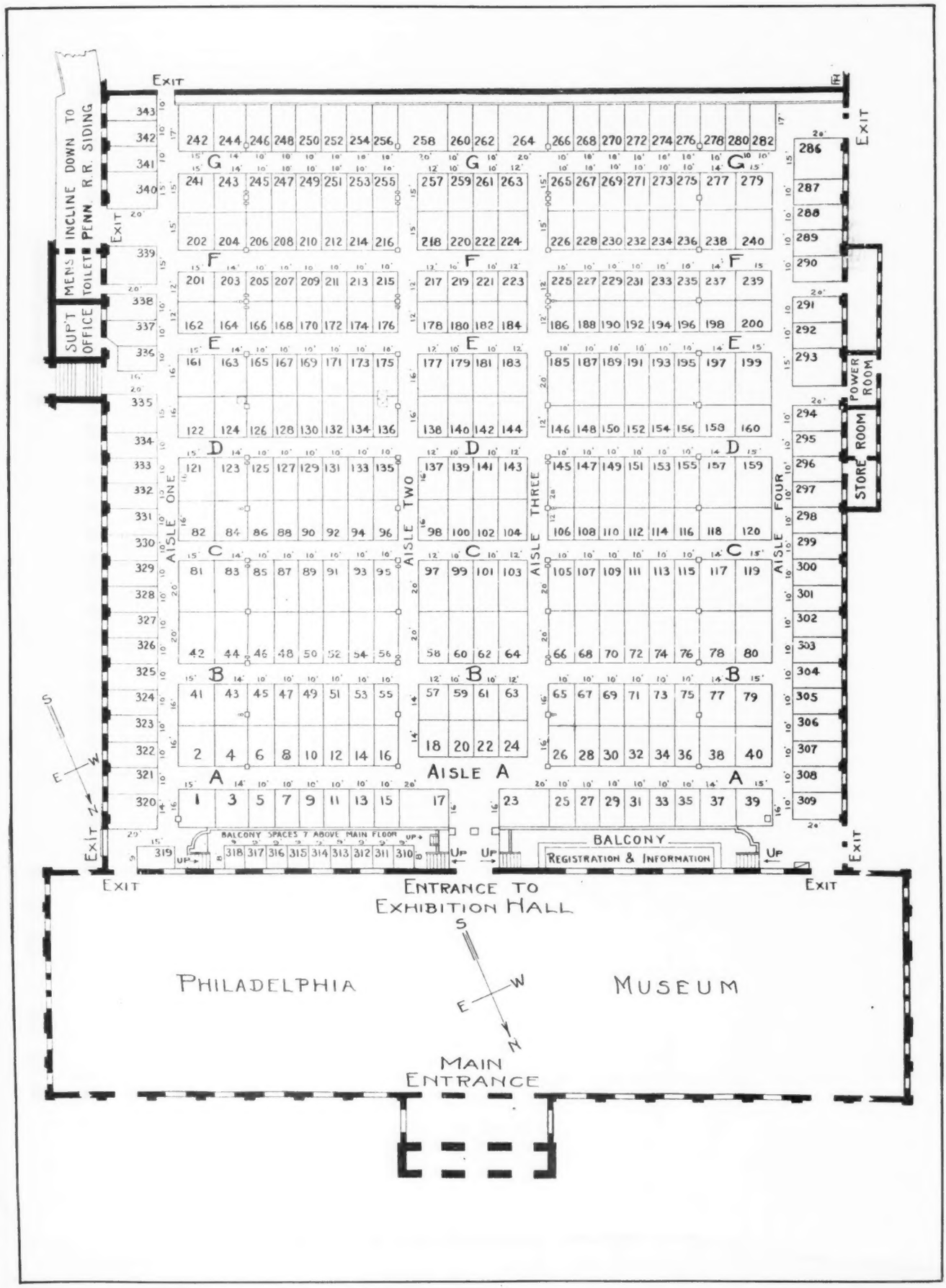
GRIMES MOLDING MACHINE CO., Detroit.—A new model jolt rollover molding machine and a small hand rollover molding machine will be exhibited; represented by George L. Grimes, L. V. Grimes, Charles Skeffington and Oswald Corliss.

HARDY, CLEMENT A., CO., Chicago.—Photographs of plants under construction by this company, including foundries for the Defiance Machine Works and the Hercules Gas Engine Co., will be shown; represented by C. A. Hardy.

HARDY, F. A., & CO., Chicago.—Safety goggles, eye protectors, masks, helmets, etc., will be displayed. The company also will exhibit safety signs, leggings, gloves and hospital apparatus; represented by A. U. Barnes.

HARRIS, BENJAMIN, & CO., Chicago.—Yellow brass and composition ingots and copper bearing materials will be exhibited in the booth occupied by this company; represented by Louis Goldman, Nathan Harris, Oscar Harris, Max Goldman and Dean F. Carscadden.

HAUCK MFG. CO., Brooklyn, N. Y.—This company will exhibit oil burning apparatus for lighting cupolas, heating ladles, drying molds and patching cores; furnaces for melting metals; sand dryers; hand kerosene torches; rivet forges; brazing and blacksmith forges; furnace burners of the low and also high pressure types; preheaters for welding; soldering iron heating furnaces, and salamanders; represented by Arthur E. Hauck, H. H. Kress, A. H. Stein, G. N.



EXHIBITION HALL, PHILADELPHIA COMMERCIAL MUSEUM, WITH EXHIBITORS' BOOTHS NUMERICALLY INDICATED

The Philadelphia Commercial Museum is on South Thirty-fourth street below Spruce street. For directions for reaching the museum from Broad street see pages 632 and 633

Exhibitors in Philadelphia Commercial Museum

No. of Booth	Exhibitor
8	Abrasive Co.
75	Acheson Graphite Co.
320, 321	Air Reduction Sales Co.
96, 98, 100, 102, 104	Ajax Metal Co.
65	American Gum Products Co.
10	American Kron Scale Co.
38	American Manganese Bronze Co.
178	American Oil & Supply Co.
289, 290	American Wood Working Mchy. Co.
185, 187, 189, 191	Arcade Mfg. Co.
88	Armstrong Cork & Insulation Co.
130	Arrow Forging & Tool Works.
71	Asbury Graphite Mills.
2, 4	Atkins, E. C., & Co., Inc.
315	Audubon Wire Cloth Co.
3	Austin Co., The
	American Tool Works.
311	Barrett Co.
29, 31	Bartley, Jonathan, Crucible Co.
160	Berkshire Mfg. Co.
81, 83	Besly, Chas. H., & Co.
34	Birkenstein, S., & Sons, Inc.
45	Black Diamond Saw & Machine Co.
	Blystone Mfg. Co.
168	Booth-Hall Co.
312	Borgner, Cyrus, Co.
30	Brass World Publishing Co.
36	Brown Instrument Co.
193	Browning, Victor R., & Co.
230, 232	Buch Foundry Equipment Co.
322, 323	Bullard Machine Tool Co.
216	Carborundum Co.
269, 271	Champion Foundry & Machine Co.
91	Chase, Frank D., Inc.
341, 342, 343	Chesapeake Iron Works.
101	Chicago Crucible Co.
333, 334, 335	Chicago Pneumatic Tool Co.
329, 330	Cincinnati Pulley Machinery Co.
110	Clark, Chas. J.
301, 302, 303, 304	Cleveland Osborn Mfg. Co.
96	Cleveland Pneumatic Tool Co.
51	Clipper Belt Lacer Co.
260, 262	Coale, Thomas E., Lumber Co.
221	Combined Supply & Equipment Co.
151	Combustion Economy Corp.
318	Collieries Supply & Equipment Co.
132	Corn Products Refining Co.
198, 200	Curtis Pneumatic Machinery Co.
23, 25	*Daily Iron Trade and Metal Market Report.*
277, 279	Davenport Machine & Foundry Co.
287, 288	Davis-Bournonville Co.
141, 143	Debevoise-Anderson Co.
127, 129	Dings Magnetic Separator Co.
89, 91	Disston, Henry, & Sons.
18	Dixon, Joseph, Crucible Co.
263	Electric Furnace Co.
140	Electric Furnace Construction Co.
43	Emmert Mfg. Co.
234, 236, 273, 275	Federal Foundry Supply Co.
223	Foreign Crucibles Corp.
23, 25	*Foundry, The*
238	Foundry Appliance Co.
237, 239	Foundry Equipment Co.
316	Foundry Manganese Co.
122, 124, 126, 128	Gardner Machine Co.
324, 325, 326	General Electric Co.
	Geometric Tool Co.
245	Gordon, Robert, Inc.
137, 139	Graceton Coke Co.
206, 208	Grand Rapids Grinding Machine Co.
114, 116	Great Western Mfg. Co.
106	Grimes Molding Machine Co.
57	Hardy, Clement A., Co.
12	Hardy, F. A., & Co.
5	Harris, Benjamin, & Co.
136	Hauck Mfg. Co.
194, 196	Hausfeld Co.
166	Haynes Stellite Co.
202, 204	Hayward Company.
254, 256	Heald Machine Co.
241, 243	Herbert, Alfred, Ltd.
258	Herman Pneumatic Machine Co.
	Higley Machine Co.
242, 244	Hoevel Mfg. Co.
310	Holcroft & Co.
97, 99	Hyatt Roller Bearing Co.
337	Industrial Electric Furnace Co.
175	Ingersoll-Rand Co.
	International Machine Tool Co.
39	International Molding Machine Co.
32	Interstate Sand Co.
15, 17	*Iron Age.*
23, 25	*Iron Trade Review, The*
20	Jennison-Wright Co.
215	Keller Pneumatic Tool Co.
144	Kellogg, Spencer, & Sons, Inc.
259	Kelly, T. P., Co.
61	King, Julius, Optical Co.
181	Klaxson Co.
27	Knoeppel, C. E., & Co.
	Kempsmith Mfg. Co.
172	Lane, H. M., Co.
170	Leeds & Northrup Co.
251	Liberty Supply Co.
255	Liberty Steel Products Co., Inc.
338	Lincoln Electric Co.
211	Lindsay Chaplet & Mfg. Co.
90, 92	Link Belt Co.
78, 80	Louden Machinery Co.
95	Lupton's, David, Sons Co.
113, 115	McCormick, J. S., Co.
41	McCrosky Tool Corp.
103	McLain's System, Inc.
22	Maclean Publishing Co.
278, 280	Macleod Company, The
201	Magnetic Mfg. Co.
203	Mahr Mfg. Co.
240	Malleable Iron Fittings Co.
77	Marden, Orth & Hastings Co.
205	Mason, Arthur C., Inc.
6	Maxon Premix Burner Co.
112	Menefee Foundry Co.
177	Mercury Mfg. Co.
59	*Metal Industry.*
16	Metal & Thermit Corp.
138	Michigan Smelting & Refining Co.
7	Mifflin Chemical Co.
282	Milburn, Alexander, Co.
339	Mine & Smelter Supply Co.
72, 74, 76	Monarch Engineering & Mfg. Co.
161, 163, 165, 167	Monarch Machinery Co.
286	Mott Sand Blast Co.
158	Mumford Molding Machine Co.
162	Napier Saw Works, Inc.
117, 119	National Engineering Co.
153, 155	Nicholls, William H., Co.
49	Norma Co. of America.
131, 133, 135	Norton Co.
	Oakley Machine Tool Co.
66, 68, 70	Obermayer, S., Co.
180	Ohio Blower Co.
169	Oldham, George, & Son Co.
157, 159, 118, 120	Oliver Machinery Co.
331, 332	Oxweld Acetylene Co.
264, 266, 268, 270, 272, 274,	
276	Pangborn Corp.
305, 306, 307, 308, 309	Paxson, J. W., Co.
23, 25	Penton Publishing Co.
222	Pettinos, Charles E.
13	Pettinos, George F.
207	Philadelphia Grease Co.
9, 11	Pickands, Brown & Co.
224	Pittsburgh Crushed Steel Co.
195	Pittsburgh Furnace Co.
145, 147, 149	Pridmore, Henry E., Inc.
182	Portage Silica Co.
250	Providence Gas Co.
40	Quigley Furnace Specialties Co.
210, 212	Racine Tool & Machine Co.
53, 55	Railway Mechanical Engineer.
24	Rainey, W. J.
179	Republic Creosoting Co.
225, 227, 229	Rich Foundry Equipment Co.
33, 35	Richards Wilcox Mfg. Co.
37	Robeson Process Co.
62, 64	Rogers, Brown & Co.
73	Roots, P. H. & F. M., Co.
231, 233, 235, 186, 188, 190, 192	Sand Mixing Machine Co.
121, 123	Sellers, William, & Co., Inc.
82, 84, 86	Shepard Electric Crane & Hoist Co.
47	Simonds Mfg. Co.
252	Skinner Bros. Mfg. Co.
226, 265	Sly, W. W., Mfg. Co.
63	Smith, R. P., & Sons Co.
58, 60	Smith, Werner G., Co.
291	Spencer Turbine Co.
111	Standard Sand & Machine Co.
171	Standard Shop Equipment Co., Inc.
257, 218, 220	Sterling Wheelbarrow Co.
249	Strauss & Buegeleisen.
292, 293	Sullivan Machinery Co.
184	Swan & Finch Co.
85	Swind Machinery Co.
294, 295, 296, 297, 298, 299, 300	Tabor Mfg. Co.
164	Thomas Elevator Co.
183	Thomas Iron Co.
313	Thompson, Lewis, & Co., Inc.
1	Truscon Steel Co.
219	United Compound Co.
142	United States Graphite Co.
197, 199	U. S. Molding Machine Co.
217	United States Silica Co.
42, 44, 46, 48, 50, 52	Van Dyck-Churchill Co.
336	Vibrating Machinery Co.
209	Willson, T. A., & Co.
340	Wadsforth, H. L.
176	Wadsworth Core Machine & Equipment Co.
110	Wangelin, Walter H., & Co.
56	Wallace, J. D., & Co.
327, 328	Warner & Swasey Co.
246, 248	Westinghouse Electric & Mfg. Co.
26	White & Bro., Inc.
261	Whitehead Bros. Co.
105, 107, 109	Whiting Foundry Equipment Co.
69	Wood's, T. B., Sons Co.
146, 148, 150, 152, 154, 156	Woodison, E. J., Co.
125	Whitman & Barnes Mfg. Co.
79	Young Bros. Co.

Broadhurst, G. T. Shanley, F. E. Giersch and A. M. Thomson.

HAUSFELD CO., Harrison, O.—A noncrucible furnace of the tilting type, a tilting crucible furnace, a stationary crucible furnace, an aluminum melting furnace using a cast iron melting pot, a ladle heater and other foundry equipment for nonferrous metal will be exhibited; represented by E. B. Hausfeld, Joseph Hausfeld and J. S. Armour.

HAYNES STELLITE CO., Kokomo, Ind.—

HAYWARD CO., New York.—An exhibit will be made of working models of clamshell and orangepeel buckets and an electric motor bucket of this type also will be shown in operation. In addition to the foregoing equipment, a collection of photographs illustrating this company's machines in operation in foundries and other industries will be displayed; represented by C. F. Hutchings.

HEALD MACHINE CO., Worcester, Mass.—The types of internal grinders, a 12-inch rotary surface grinder and a cylinder grinder will be exhibited by this company. One of the internal grinders is a new machine which never has been exhibited and which has not been sold. The rotary surface grinder also is new. The cylinder grinder is designed for work which cannot be revolved; represented by S. M. Hershey.

HERBERT, ALFRED, LTD., New York.—British-made machine tools bearing the name of this company will be exhibited for the first time in the United States. All of the machines will be shown in operation. An oscillating tool grinder which produces cutting tools from bar stock by grinding and which, except for special shapes, eliminates the necessity of tool forging, will be shown. A hexagon turret lathe with a capacity of 1⅝ x 27 inches for rapid production of bar work and a combination turret lathe especially adapted for chucking work will be exhibited. Both machines are of the single pulley geared head type. The hexagon turret lathe is equipped with quick power traverse and the turret is rotated by power. A concentric chuck which is adapted for eccentric and irregular work will also be shown; represented by Messrs. Blake, Blair, A. Thornton and Albin.

HERMAN PNEUMATIC MACHINE CO., Pittsburgh.—A plain jarring machine, with the table plate off of the base to show the mechanical construction of the machine will be exhibited; represented by Thomas Kaveny, H. T. Frauenheim, Robert F. Ringle, I. J. Oesterling, R. P. Morgan, Robert Porteous, Walter Hughes, C. S. McMath and C. W. Miller.

HIGLEY MACHINE CO., So. Norwalk, Conn.—A motor-driven cold saw will be exhibited in the booth of the Vandyck-Churchill Co.; represented by C. Granger.

HOEVEL MFG. CORP., Jersey City, N. J.—This company will have a working exhibit consisting of a revolving barrel and rotary table sandblast machine; represented by H. F. Hoevel and L. B. Passmore.

HOLCROFT & CO., Detroit.—Photographs, drawings and data on various types of metallurgical furnaces and foundry ovens and also data on special electric furnaces, will be exhibited by this company; represented by Charles T. Holcroft, E. V. Holcroft, W. H. Holcroft, Harry Holcroft and H. L. Ritts.

HYATT ROLLER BEARING CO., New York.—This company will exhibit a large revolving model of roller bearing showing the principles of design and construction; a roller bearing mounted in glass showing the lubrication principles of the bearing; an automatic lantern slide machine showing pictures of roller bearing equipped machinery; and a truck test stand having roller bearing-equipped trucks and plain bearing trucks, demonstrating easy running qualities of the roller bearing equipped trucks; represented by D. Gleisen, P. C. Gunion, M. F. Lawrence, G. O. Helmstaedter, W. L. Hiff, J. M. Hancock and H. L. Littell.

INDUSTRIAL ELECTRIC FURNACE CO., Chicago.—Illustrations of the furnaces made by this company and their applications to various branches of the foundry industry will be shown. A recently developed process of preheating the charge before placing it in the electric furnace, will be described; a new jolt shakeout machine for separating sand from castings and flasks will be illustrated; represented by F. von Schlegell, W. B. Lewis and W. B. Cooley.

INGERSOLL-RAND CO., New York.—Portable pneumatic tools including sand rammers, motor hoists, chipping hammers, riveting hammers, grinders and drills will be exhibited. The sand rammers, motor hoists, grinders and chippers will be in operation; represented by W. A. Johnson, W. B. Brendlinger, P. T. Christy, N. A. Pelham and G. C. Williams.

INTERNATIONAL MACHINE TOOL CO., Indianapolis.—An 18-inch Libby turret lathe working on cast iron gears will be exhibited by this company through its Philadelphia representative, Vandyck-Churchill Co.; the International Machine Tool Co. will be represented by J. A. Villard.

INTERNATIONAL MOLDING MACHINE CO., Chicago.—Molding machines including hand and power turnover machines, jarring machines, squeezers, stripping plate machines and various types of combination machines will be exhibited; represented by Edward A. Pridmore, W. W. Miller, F. W. Hamel and E. G. Borgnis.

INTERSTATE SAND CO., Zanesville, O.—This exhibit will consist of molding sands for iron and steel castings; fire clay; silica washes and ganister; represented by L. K. Brown, E. M. Ayers and O. Tague.

IRON AGE, New York.

IRON TRADE REVIEW, THE, Cleveland.—This booth will be fitted up as a rest room for visitors where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, H. Cole Estep, G. O. Hays, E. L. Shaner, H. E. Diller, D. M. Avey, Pat Dwyer, Charles Vickers, J. F. Ahrens, F. V. Cole, H. O. Taylor and Paul R. Fisher.

JENNISON-WRIGHT CO., Toledo, O.—Samples of the wood blocks manufactured by this company for factory floors will be exhibited and a made-up section of wood block flooring will be displayed. Large photographic reproductions of wood block floors now in service in many well known foundries and machine shops in the United States will be shown; represented by F. E. Jennison and L. P. Drinker.

KELLER PNEUMATIC TOOL CO., Chicago.—A large riveting hammer mounted in a heavy gilt frame and with sections cut out to show all parts moving in the same manner as those in a standard hammer operated by air will be shown. Drills and other tools in operation with portions of the wall removed to show the movement of the parts will be displayed, together with complete models of riveting and chipping hammers, valve and valveless rotary and piston drills, jam riveters, holders-on and sand rammers; represented by W. H. Keller, J. G. Osgood, G. E. McCabe, F. S. Eggleston Jr., W. J. Devlin, C. A. Bremmer, L. B. Smyser, Edward L. Lycett and A. G. Swope.

KELLOGG, SPENCER, & SONS, INC., Buffalo.—Various grades of core oils made by this company and a number of interesting cores produced with these oils and also castings and photographs of large castings produced by the use of cores made with these oils will be on exhibition; represented by V. H. Hunter, U. L. Throm, A. P. Mason, J. N. Yaeger, W. L. Goetz, E. G. Allen and Burt Cox.

KELLY, T. P., & CO., New York.—The booth occupied by this company will be fitted up as a rest room; represented by V. J. Rohe, H. J. Winters, B. H. Forman, H. F. Maurel and W. F. Kaine.

KING, JULIUS, OPTICAL CO., Chicago.—Safety goggles, glass for goggles, and protective helmets, masks, etc., will be exhibited; represented by W. G. King.

KLAXON CO., New York.—This company will demonstrate a code calling device for locating men at any point in a manufacturing plant or foundry. The company also will exhibit industrial horns for signalling purposes and a specially designed telephone which is a loud speaking phone for quick, convenient intercommunication; represented by E. Berg, P. C. Gunion, R. L. Wilkinson and A. W. Hall.

KNOEPPEL & CO., C. E., New York.—Graphic production control boards designed for controlling the factors effecting foundry operation and production will be exhibited. This system of vizualized control is designed to definitely govern the movement of material, application of labor, the use of equipment and machines, and furnishes records of plant conditions and performances for cost analysis; represented by J. P. Jordan and Irving A. Berndt.

KEMPSMITH MFG. CO., Milwaukee.—A horizontal plain milling machine equipped with single pulley drive, 1¼-inch arbor, two arbor supports, plain vise and necessary accessories will be shown. This machine has 18 feeds and speed changes, the feeds varying from ⅝ to 25 inches per minute. This machine will be exhibited through the Vandyck Churchill Co., Philadelphia. The Kempsmith Mfg. Co. will be represented by Peter Lowe and Mr. Drewes.

LANE, H. M., CO., Detroit.—Photographs and drawings of the engineering work of this company will be shown; represented by H. M. Lane, A. O. Thomas, Benjamin Towlen, Charles R. Seabrook, D. W. F. Nichols, A. O. Thomas, Charles Rochefort.

LEEDS & NORTHRUP CO., The, Philadelphia.—Pyrometer equipment consisting of indicating and recording instruments used in controlling temperatures in the foundry such as core ovens, etc., will be exhibited. An optical pyrometer for reading temperatures of molten metals also will be shown; represented by G. W. Tall Jr., E. B. Estabrook, Oscar Brewer and A. M. Redding.

LIBERTY STEEL PRODUCTS CO., INC., New York.—Two types of a gasoline motor driven industrial tractor and two lift trucks will be exhibited. A model of the type of sectional steel building manufactured by this company will be shown; represented by Charles K. Drury, W. Robbins, T. L. Lawry, S. W. Midg'ey, W. S. Ottinger Jr. and A. H. Dillon Jr.

LIBERTY SUPPLY CO., Pittsburgh.—

LINCOLN ELECTRIC CO., Cleveland.—This company will exhibit arc-welding apparatus used in foundries. A motor operating under water and several sizes and types of foundry motors will be shown; represented by Robert E. Kinkead, Dorsey C. Anderson, O. P. Lang and P. C. Pipes.

LINDSAY CHAPLET & MFG. CO., Philadelphia.—This exhibit will consist of chaplets ranging in size from those ¼-inch in length used for motor castings to large double head chaplets having ¾ and 1-inch stems and being as long as 6 inches with plates 4 x 4 inches square and ¼-inch thick used in connection with making castings for bed plate castings for gun presses; represented by Stanley B. Wentz, James C. Newlin Jr. and Herman E. Mandel.

LINK BELT CO., Philadelphia.—This company will exhibit a machine which reclaims used molding sand. This machine tempers and mixes the sand and prepares it for further use. An overhead monorail electric hoist equipped with cord operated control designed for handling molds and cores without jarring will be exhibited. A silent chain drive will be in operation; represented by A. G. J. Rapp, F. F. Waechter, James Monroe and L. Spillan.

LOUDEN MACHINERY CO., Fairfield, Iowa.—Overhead tracks and trolleys for use in foundries will be exhibited. Special carriers and containers for metal and various foundry materials will be shown; represented by H. M. Miller, L. E. Gaston, C. S. Doran, H. W. Cuddy and L. E. Bertho'd.

LUPTON'S, DAVID, SONS' CO., Philadelphia.—Samples of pivoted steel sash, counterbalanced steel sash, power house steel sash, and continuous sash designed for monitor, sawtooth and sidewall construction will be shown. About 10 typical cross-sections of foundries and buildings of similar nature will be shown on a mechanically operated device especially built for this exhibit; represented by Clarke P. Pond, C. F. P. Buckwalter, R. A. Sanborn and H. R. Wilkinson.

McCORMICK, J. S., CO., Pittsburgh.—Included in the foundry equipment exhibited by this company will be a pneumatic blacking mixer operated with outlets for spraying purposes; an electric magnetic separator which will be shown in operation; an embossing machine for use in the pattern shop, and samples of blacking made by this company; represented by J. S. McCormick, T. E. Malone and S. R. Costley.

McCROSKY TOOL CORP., Meadville, Pa.—This exhibit will consist of a complete line of adjustable reamers, quick change chucks and collets for drill

press work, turret tool posts for lathes, and universal lamp brackets; represented by C. M. Sutton, C. Harper Halfmann and M. J. Frank.

MACLEAN PUBLISHING CO., LTD., Toronto, Ont.—The booth occupied by this company will be fitted out as a rest room; represented by A. R. Lowe, A. H. Byrne, B. G. Newton and F. H. Bell.

McLAIN'S SYSTEM, INC., Milwaukee.—Samples of semisteel castings of light sections including automobile cylinders containing from 20 to 30 per cent steel; and gears, pistons, projectiles and other samples of semisteel castings containing from 20 to 50 per cent steel will be shown. Open-hearth steel castings poured from metal made in a McLain-Carter oil-fired, open-hearth furnace will be displayed; represented by David McLain, Harry McLain and I. V. Scanlan.

MACLEOD CO., THE, Cincinnati, O.—Two sand blast barrels, a sand blast hose machine and portable oil burners will be exhibited by this company; represented by Harry Rittmeyer.

MAGNETIC MFG. CO., Milwaukee.—Various types of magnetic separators built by this company will be shown in operation. These will include a machine of all-steel construction for reclaiming metal from foundry refuse and cupola drop. A magnetic pulley provided with ventilating device will be shown; represented by R. H. Stearns, J. P. Bethke and R. N. Stearns.

MAHR MFG. CO., Minneapolis.—This company will exhibit foundry torches, oil and gas fired rivet forges, ladle driers and ladle heaters; represented by H. H. Warner, W. G. Barstow and R. B. Ecker.

MALLEABLE IRON FITTINGS CO., Branford, Conn.—A number of vibrators manufactured by this company will be operated by compressed air on a specially built frame. A vibrator core bench for making small cores by the multiple system will be shown and girl operator will demonstrate the machine; represented by G. B. Pickop, also H. J. Felsburg of J. Jacob Shannon Co.

MARDEN, ORTH & HASTINGS CORP., New York.—The booth occupied by this company will be fitted up as a reception room. Cores made by the liquid and powdered sand binder manufactured by this company and samples of these materials will be shown; represented by H. M. Handy.

MASON, ARTHUR C., INC., Hawthorne, N. J.—The high speed, quick change sensitive bench drill manufactured by this company will be exhibited; represented by C. A. Widmer, Arthur C. Mason and William Reynolds.

MAXON-PREMIX BURNER CO., Muncie, Ind.—Fuel burners will be exhibited.

MERCURY MFG. CO., Chicago.—

METAL INDUSTRY, New York.—The booth occupied by this company will be fitted out as a rest room; represented by P. H. Langdon, Adolph Bregman, G. W. Cooper, T. A. Trumbour and H. C. Burr.

METAL & THERMIT CORP., New York.—Transparencies and photos showing various applications of thermit for welding and demonstrating the use of thermit for pipes, will be displayed. Heating cans for foundry work and small welds will be exhibited; represented by W. R. Hulbert, A. F. Braid, H. G. Spilsbury, J. G. McCarty and H. D. Kelley.

METALLIC ABRASIVES MANUFACTURERS' ASSOCIATION OF AMERICA, Pittsburgh.—Metallic abrasives for sand blasting will be exhibited; represented by G. H. Kann, Pittsburgh Crushed Steel Co.; N. C. Harrison, Harrison Supp'y Co.; H. M. Ream, Globe Steel Co.; I. A. Diamondstone, Harrison Bros., Inc., and R. S. Kann, Pittsburgh Crushed Steel Co.

MICHIGAN SMELTING & REFINING CO., Detroit, Mich.—Nonferrous metal products including ingot, brass and bronze, solders, babbitt metals, lead pipe, brazing spelter, etc., will be exhibited; represented by R. H. Evans, Norman Sillman, Maj. F. C. Bahr, Henry Levitt, C. T. Bragg, R. R. Arnold and William W. Eitel.

MIFFLIN CHEMICAL CORP., Philadelphia.—Samples of the core binder made by this company and cores produced by the use of this binder will be exhibited; represented by Phillip Publicker, Harry Cohen and W. J. Lehman.

MILBURN, ALEXANDER, CO., Baltimore.—Oxyacetylene welding and cutting apparatus, including an acetylene welding generator, combination welding and cutting torches, welding torch operating on equal pressures of oxygen and acetylene, a lead-burning apparatus, portable carbide lights ranging in size from 1000 to 15,000 candlepower and a light and heating burner which uses kerosene oil; represented by A. F. Jenkins.

MINE & SMELTER SUPPLY CO., New York.—A Wilfley table of laboratory size will be shown in operation; represented by E. S. Tompkins.

MONARCH ENGINEERING & MFG. CO., Baltimore.—The following furnaces will be exhibited by this company: Four types of noncrucible furnaces including a double chamber furnace, a vertical furnace and a rotary furnace; a tilting coke-fired furnace with crucible; a tilting oil-fired furnace with crucible; three oil-gas and coke-fired core ovens; a ladle heater and a stationary oil or gas-fired steel furnace; represented by H. D. Harvey, James J. Allen, Frank P. Maujean and William Raber.

MONARCH MACHINERY CO., Philadelphia.—The following machines will be exhibited: A 32-inch shaper; several types of heavy duty and high-speed drill presses, two types of milling machines, and an engine lathe; represented by Edwin R. Mack, Austin H. Campbell, Robert L. Arms, Henry M. Shaw, Andrew J. Berger, A. W. Heppard and E. W. Stegman.

MOTT SAND BLAST CO., New York.—A sand blast barrel will be shown in operation. In addition a late type of cloth screen dust arrester will be operated and a complete line of accessories, such as hose, helmets, nozzles, gloves, etc., will be shown; represented by David Mayer, E. J. Rosenthal, E. C. Gilmour and R. E. Donnelly.

MUMFORD MOLDING MACHINE CO., Chicago.—A new combination jolt split pattern molding machine fitted with automatic, slow-start oil pattern draft cylinder, controlled by a knee valve will be exhibited. This machine is designed to give a smooth, slow start for the first three-quarters of an inch with a rapid finish for the balance of the pattern draw, thereby leaving the operator's hands entirely free to pick up the mold the instant the pattern is drawn; represented by P. W. Gates, James T. Lee, O. F. Weiss and J. O. Clark.

NAPIER SAW WORKS, Springfield, Mass.—A motor-driven horizontal band saw will be shown in operation; hack saws made by this company also will be exhibited; represented by A. C. Whitefield and H. M. Reynolds.

NATIONAL ENGINEERING CO., Chicago.—Three sand mixers varying in size from 3 to 6 feet in diameter will be exhibited. The 6-foot machine will be in operation during the convention and will mix facing sand, core sand and other mixtures; represented by H. S. Simpson.

NICKOLLS, WILLIAM H., CO., New York.—

NEW CHICAGO CRUCIBLE CO., Chicago.—Graphite crucibles manufactured by this company will be exhibited; represented by Dr. Sherman Taylor, Adolph Hottinger, LeRoy C. Taylor, James Foraker, J. W. Mann and John Kroll.

NORMA CO. OF AMERICA, New York.—Ball bearings manufactured by this company for use in fractional horsepower electric motors, high speed grinders, portable electric drills, high speed sensitive drill presses, etc., will be exhibited; represented by Norman Bell, Arthur Meder, D. E. Batesole and George R. Bott.

NORTON CO., Worcester, Mass.—This company will exhibit the following: One 6 x 32-inch plain cylindrical grinding machine; one 2-inch floor stand; one 1¼-inch floor stand; one ¾-inch bench machine, motor driven; one universal tool and cutter grinder; and various grinding wheels for use in the foundry and an exhibit of tool and cutter grinding wheels. Polished stove parts ground by abrasives made by this company also will be shown; represented by S. A. Craig, W. R. Strong, E. F. Anderson, Herbert Duckworth, Wallace T. Montague, E. W. Barnes and C. H. Wood.

OAKLEY MACHINE TOOL CO., Cincinnati.—The universal cutter and tool grinder manufactured by this company, equipped with power feed, wet grinding attachment and motor drive will be operated; represented by Abbot A. Thayer.

OBERMAYER, S., CO., Chicago.—This company will exhibit a sprue cutter, tumbling barrel, ladles, and other small foundry equipment. The use of a furnace cement manufactured by this company will be demonstrated in a small electric furnace; represented by S. T. Johnston, E. D. Frohman, J. L. Cummings, William Fitzpatrick, J. J. McDevitt, W. J. Adams, I. D. Adams, J. E. Evans, O. J. Peterson, O. C. Olson, C. M. Barker and William Fenton.

OHIO BLOWER CO., Cleveland.—This company will exhibit a portable core oven complete, a section of a rack type and truck type oven showing corners and door construction; rotary ball bearing ventilators; air separators, and air traps; represented by David Johnson, George Thomson, Herbert Brandt, Thomas Whitaker, Eugene Van Note and H. A. Bogardus.

OLDHAM, GEORGE, & SONS CO., Frankford, Philadelphia.—Chipping hammers, foundry rammers and core busters will be exhibited by this company; represented by Messrs. Fraser and Biles.

OLIVER MACHINERY CO., Grand Rapids, Mich.—A complete pattern shop will be operated by this company. All of the following machines will be operated: A universal wood milling machine; a vertical disc and spindle sander; two types of hand planer and jointer; a universal bench saw; a combined band re-saw and scroll saw; a band sawing machine; a pattern maker's lathe; two types of wood trimmers, a revolving oil stone tool grinder; a pattern maker's bench; a type embossing press; a surface planer; an extra heavy duty engine lathe; a tool room engine lathe, and a die filing machine. Complete patterns will be turned out from this shop during the convention; represented by R. F. Baldwin, Arthur Blake, J. Ray Bate, G. C. Conklin, C. R. Crossley, Dolph De Young, C. A. Ginter, J. E. McLauchlen, Arie Steenbergen and A. S. Kurkjian.

OXWELD ACETYLENE CO., Newark, N. J.—This company will exhibit and make practical demonstrations of oxyacetylene cutting and welding apparatus; represented by W. E. Cotter, W. B. Wilson, V. L. Mauhowt, G. R. Mitchell and F. W. Smith.

PANGBORN CORP., Hagerstown, Md.—The exhibit of this company will be more extensive than in previous shows. The equipment, which will be in operation, will include cabinet sand blasting outfits, barrel sand blasts, rotating table cabinet and plain rotating table apparatus, hose machines, sand separators, dust arresters and exhausters. Actual installations made by the Pangborn Corp. will be shown by a stereopticon machine; represented by Thomas W. Pangborn, John C. Panghorn, Harry D. Gates, W. C. Lytle, P. J. Potter, George A. Cooley, Charles T. Bird, Jesse J. Bowen, Roy C. Koch, J. F. Tracey, T. R. Ditty, Hugo F. Liedtke and Foster J. Hull.

PAXSON CO., J. W., Philadelphia.—Products manufactured by this company, including foundry facings, foundry sands, gravels and clays and other supplies and equipment will be exhibited; represented by H. M. Bougher, Howard Evans, S. C. Bougher, H. J Bougher, F. B. Platt, J. S. Hibbs, A. G. Warren John S. Gilbert and I. F. Kremer.

PENTON PUBLISHING CO., Cleveland.—This booth will be fitted up as a rest room for visitors where all are invited to make their headquarters; represented by John A. Penton, A. O. Backert, J. D. Pease, H. Cole Estep, G. O. Hays, E. L. Shaner, H. E. Diller, D. M. Avey, Pat Dwyer, Charles Vickers, J. F. Ahrens, F. V. Cole, H. O. Taylor and Paul R. Fisher.

PETTINOS, CHARLES E., New York.—Foundry sand suitable for steel, gray, iron, brass, bronze and aluminum castings, plumbago for various uses, and graphite will be shown; represented by Charles E. Pettinos, M. M. Houskeeper, J. H. Bing, Martin Meiss and W. H. Laros.

PETTINOS, GEORGE F., Philadelphia.—The booth occupied by this company will be fitted up as a reception room; represented by George F. Pettinos and H. B. Taylor Jr.

PHILADELPHIA GREASE CO., Philadelphia.—Various grades of the grease made by this company for lubricating all classes of machinery and especially pneumatic tools will be exhibited; represented by

Messrs. Dean, Maloney, White and Horace A. Smith.

PICKANDS, BROWN & CO., Chicago.—This company will exhibit by-product coke in conjunction with the Semet-Solvay Co. The front of Independence hall, Philadelphia, will be reproduced in a structure of coke, the top of the tower reaching about 15 feet above the floor. George A. T. Long, whose work with coke has attracted considerable attention at previous shows, will erect this year's exhibit; represented by Thomas W. Glasscot, James A. Galligan, James A. Ballard, William H. Ball and George A. T. Long.

PITTSBURGH FURNACE CO., Milwaukee.—Photographs of the electric furnace installed by this company in steel mills and steel castings plants will be displayed; represented by J. F. Dirzuweit and E. V. Kane.

PORTAGE SILICA CO., Youngstown, O.—This company will exhibit photographs of its plant and samples of silica rock in its natural state and of the finished sand produced from it; represented by E. E. Klooz and L. R. Farrell.

PRIDMORE, HENRY E., Chicago.—A number of molding machines, including a plain electric jolt machine, a jolt strip and jolt roll-over machine, a hand roll-over machine and a hand stripping plate machine will be exhibited; represented by Mrs. Henry E. Pridmore, H. A. Pridmore, George Furman, H. G. Schlichter, D. F. Eagan, C. H. Ellis, J. W. Dopp, Hugh Gallagher and Marshall E. Pridmore.

PROVIDENCE GAS CO., Providence, R. I.—This company will exhibit foundry coke; represented by C. H. Tholl, M. B. Beck and W. G. Rich.

QUIGLEY FURNACE SPECIALTIES CO., New York.—A refractory material for bonding fire brick will be demonstrated. Temperature tests on this material will be made by means of electric furnaces and various metallurgical applications of this material will be illustrated. A refractory fire sand for making rammed-in linings, special tile and for repairing furnace structures will also be shown. A powdered coal system for preparing, transporting and burning powdered coal will be featured; represented by W. S. Quigley, J. H. McPadden, L. G. McPhee, H. M. Miller, C. E. Pullum, George R. Powell, C. E. Klein, F. W. Reisman, S. D. Enoch and F. G. Wenzel.

RACINE TOOL & MACHINE CO., Racine, Wis.—Three types of the high-speed metal cutting machines made by this company will be exhibited. The tools exhibited will be of 6 x 6-inch, 8 x 8-inch and 12 x 15-inch capacity respectively. A 6 x 6-inch machine will be operated and a high-speed rail cutting machine will be shown; represented by A. H. Goetz, E. R. Larson, T. A. Hyde, D. B. Maxwell, Ralph Maxwell, N. R. Petersen, F. J. Kidd and William Reinhardt.

RAILWAY MECHANICAL ENGINEER, Chicago.

RAINEY, W. J., Philadelphia.—Samples of Connellsville beehive and rectangular oven foundry coke and photographs of a number of operations producing this grade of fuel will be shown. By-product foundry and furnace coke and photographs showing the erection and operation of a by-product plant at Swedeland, Pa., will be shown; represented by A. F. Kempe, R. I. Willcox, H. B. Prescott and W. H. Vermilya.

REPUBLIC CREOSOTING CO., Indianapolis.—Exhibits of interior wood-block floor installations will be featured; represented by H. G. Stephens and G. Nelson.

RICH FOUNDRY EQUIPMENT CO., Chicago.—(See Sand Mixing Machine Co.)

RICHARDS-WILCOX MFG. CO., Aurora, Ill.—This company will exhibit overhead carrying systems including trolley and I-beam types of monorail tracks with switches, cross-overs, turntables, trolleys, etc. A traveling crane and hoists will be shown; represented by A. J. Eggleston and E. J. G. Phillips.

ROBESON PROCESS CO., New York.—Cores bound with the core binder manufactured by this company will be exhibited; represented by G. I. Lindsay, C. A. Rapallo, T. J. Ryan and T. J. O'Hara.

ROGERS, BROWN & CO., Cincinnati.—This company will exhibit samples of foundry coke, alloys, pig iron and fluor spar. Finished iron castings of intricate design produced from these materials will be shown and in addition, a 12-cylinder Liberty motor loaned through the courtesy of the Lincoln Motor Co., Detroit, and especially constructed by it as a permanent exhibit at the Smithsonian institute, Wash., will be exhibited; represented by S. W. Hubbard, T. A. Wilson, A. O. Sonne, H. W. Fernald, F. E. Fitts, R. W. Clark, J. A. Claussen, George R. Sullivan, Richard Peters Jr., S. B. Morrison, H. B. Carson, F. J. Waldo, A. F. Stengle, F. W. Bauer, A. J. Wentworth and J. R. Morehead.

ROOTS CO., P. H., & F. M., Connersville, Ind.—A number of the smaller blowers manufactured by this company will be exhibited, including the first blower ever constructed by the P. H. and F. M. Roots Bros., 60 years ago; represented by E. D. Johnston and H. M. Papworth.

SAND MIXING MACHINE CO., New York.—This company will exhibit the following products of the Sand Mixing Machine Co., the American Foundry Equipment Co. and the Rich Foundry Equipment Co., which recently were combined and now operate under the name of the American Foundry Equipment Co.: An auto sand cutter designed to cut, mix and pile sand on molding floors a rotary sand blast table room; a gravity feed barrel; an annealing oven truck, and a core making machine; represented by V. E. Minich, Elmer A. Rich Jr., Hutton H. Haley, John D. Alexander, Charles G. Smith, Jerome E. Sweet and C. B. Schneible.

SELLERS, WM., & CO., INC., Philadelphia.—This company will exhibit a centrifugal sand mixing machine, belt and motor driven; a motor-driven universal tool grinding and shaping machine, and a motor-driven twist drill grinding machine; represented by Edward L. Holljes, Charles T. Wilson and Stephen A. Smith.

SHEPARD ELECTRIC CRANE & HOIST CO., Montour Falls, N. Y.—This company will erect a special structure of which various types of hoisting equipment will be exhibited. Among the types of hoisting apparatus shown will be a standard crane trolley operated by controllers from the floor; a cage operated hoist with an electric magnet; two standard types of floor operated hoists and a new type of electric cargo winch. This winch, which will be shown in operation, consists of a cast base upon which is mounted a back geared motor with a special drum and winch head. The head is so arranged that it works independently of the drum, so that the load may be held stationary at any point by means of ratchet and pawl while the boom is either raised or lowered or swung around by the winch head. The power is furnished through a standard slow speed crane motor and a double gear train of internal gears; represented by W. C. Briggs, R. W. Hurst, F. E. Meeks, R. J. Wadd, N. P. Farrar, D. B. Patterson, H. W. Gledhill, John Jackson, W. C. Minier, G. N. French, Walter B. Briggs, R. H. McGredy, A. J. Barnes and John Guyer.

SIMONDS MFG. CO., Fitchburg, Mass.—Saws for cutting various kinds of metal will be exhibited and a metal saw sharpening machine will be demonstrated; represented by H. B. McDonald and Spencer Patterson.

SKINNER BROS. MFG. CO., St. Louis.—A motor-driven 4 x 4-foot heater for heating foundries and industrial plants will be shown in operation. This apparatus exhausts cold air from the foundry floor in cold weather and forces it up through a set of pipe coils and out through a directing elbow outlet; represented by Edwin C. Evans, C. V. Haynes and Mr. Sewell.

SLY, W. W., MFG. CO., Cleveland.—This company will exhibit the following: A sand blast mill; a turntable cabinet complete with sand and dust elevating and separating system; a hand sand blast cabinet; a sand blast cage; a tumbling mill; a resin mill; a sand blast pressure tank, and photographs and sand blast test plates; represented by W. C. Sly, George J. Fanner, E. J. Moore, P. W. Graue, D. E. Hadley and S. H. Baird.

SMITH, R. P., & SONS, Chicago.—Safety shoes for molders and foundrymen will be exhibited; represented by J. B. Smith Jr.

SMITH, WERNER G., CO., Cleveland.—Samples of the core oils made by this company will be displayed along with specimens of cores and castings made from these products; represented by Werner G. Smith, Frank H. Dodge, L. P. Robinson, M. S. Finley, W. E. Rayel, F. K. Sawyer, J. C. DeVenne and L. F. Ferster.

SPENCER TURBINE CO., Hartford, Conn.—A 15-horsepower turbine compressor for use in supplying air for cupolas will be exhibited; represented by H. M. Grossman and S. E. Phillips.

STANDARD SAND & MACHINE CO., Cleveland.—This exhibit will consist of a motor-driven sand mixer; represented by Harry E. Boughton.

STANDARD SHOP EQUIPMENT CO., INC., Philadelphia.—Standard methods and standard equipment for properly setting up work on machine tools will be displayed. The following appliances will be shown: T-head steel slot bolts, double and single end clamps, packing and step blocks, nuts and washers, bolt spacers and drop forge wedgers; represented by H. J. Stites and M. M. Sarben.

STERLING WHEELBARROW CO., Milwaukee.—Foundry flasks, wheelbarrows, core barrows, etc., will be exhibited. A feature of the exhibit of this company will be samples of very large flasks, complete with intricate bars; represented by I. R. Smith, H. H. Baker, A. E. Welch, J. J. Coyne, H. Kalthoff, R. F. Jordan, George H. Lambkin, Charles L. Kirk, J. W. Dopp and J. M. Patterson.

STRAUSS & BUEGELEISEN, New York.—This exhibit will consist of laminated glass manufactured by this company, welding goggles and goggles for all hazardous operations in the foundries; represented by M. Walter, L. V. Siegel, D. Buegeleisen and J. Buegeleisen.

SULLIVAN MACHINERY CO., Chicago.—This company will operate a 14 x 8¾ x 10-inch angle compound belt-driven air compressor at 50 revolutions per minute with a displacement of 445 cubic feet of air per minute. The machine will be driven by a 75-horsepower General Electric motor, and will compress air for other exhibitors at the show. A 10 x 10-inch straight line single-stage belt-driven compressor equipped with a new design of plate valve, also will be exhibited; represented by Arthur E. Blackwood, J. B. Pratt and Alexander Milne.

SWAN & FINCH CO., New York.—Cores in which the core oil manufactured by this company has been used will be exhibited; represented by Richard Thackray, Edward F. Ryan, Mr. Chamberlin, C. G. Howe, C. B. Lamson, T. P. James, George J. Graham, J. A. Ellis and H. J. Waldron.

SWIND MACHINERY CO., Philadelphia.—This company will exhibit an 18-inch x 8-foot geared head lathe; a heavy-duty drill; a sheet metal cutter and an internal grinding machine. All of these machines are motor driven; represented by L. H. Swind, J. E. Brandt, W. J. Powers, M. R. Carson and D. M. McCracken.

TABOR MFG. CO., Philadelphia.—The exhibit will include plain power squeezer, combination jarring squeezer, power squeezing split pattern, jarring squeezing split pattern, plain jarring machine, jarring and roll over, hand ramming roll over, and jarring stripping plate types of molding machines. A saw and milling cutter also will be exhibited; represented by Wilfred Lewis, H. W. Brown, J. T. Ramsden, J. H. Coleman, H. W. Impey, W. E. Sewell, D. J. Martin, John Fendner, E. S. Lewis, Jacob Degler, Philip Shire and T. L. Sumner.

THOMAS ELEVATOR CO., Chicago.—Wrenchless chucks and drill press vises will be operated; represented by Messrs. Moorse, Cassell and Bolduck.

THOMAS IRON CO., Hokendauqua, Pa.—Samples of pig iron, ore and castings in which these materials have been used will be exhibited; represented by Philip E. Wright.

THOMPSON, LEWIS, & CO., INC., Philadelphia.—Several patterns made from mahogany many years ago will be shown by this company to demonstrate the quality of this wood; represented by Charles H. Thompson Jr. and L. P. Bransford Jr.

TRUSCON STEEL CO., Youngstown, O.—The exhibit will consist of pressed steel foundry flasks; a pressed steel platform for lift trucks; photographs and layouts of various types of industrial buildings, and side wall steel windows, top hinge continuous monitor steel sash and a tension operating device;

(Concluded on page 646)

Making Alloy Castings at Cramp's

Metals Used and Finished Product Must Meet Exacting Tests—Three Melting Methods Employed—Bronze Propellers Molded in Loam—Small Work is Mounted on Match Plates

IN the number and importance of its brass, bronze and aluminum foundries, as in other directions in the metallurgical field, the United States leads the world. At the present time our widely diversified industries support the activities of over 3500 nonferrous casting plants. The marine field affords one of the principal outlets for the energies of these establishments, specially along the coasts and lakes. Brass, bronze and special alloy castings are used on shipboard in many places where a corrosion resisting metal is necessary; the exacting requirements of sea service also demand specially high grade bearing metals, valves, fittings, engine parts, etc.

It is logical therefore to find some of the most interesting, progressive and up-to-date nonferrous foundries in the country operated in connection with our large shipbuilding establishments. Preeminent among the shops in this category is the brass, bronze and alloy foundry of William Cramp & Sons Ship & Engine Building Co. This plant is particularly interesting because of the enviable history of the Cramp company. Few indeed are the concerns in this country which can trace a continuous existence for ninety years. William Cramp, the record shows, commenced business building ships on the Delaware in 1830. The founder prospered in his efforts and the company was incorporated under its present name in 1872. Up-to-date the Cramp yard has launched 480 vessels, including many large ocean liners and American and foreign battleships. During the war, this great works, on account of its complete facilities and organization, was a priceless asset to the country.

Foundry Established in 1885

The brass foundry at Cramp's was established in 1885 in order that the company might have adequate facilities for the production of the special alloys necessary in ship and engine building. Naval bronzes, which must be made to exact specifications, form an important part of the output of this department.

In addition to its own developments in the alloy field, in 1894 the Cramp company made a contract with the Manganese Bronze & Brass Co., of Great Britain, covering the exclusive use and control of the formulas and process of this concern in America. This contract included the right to make manganese-bronze and white brass under the Parsons patents.

The nonferrous foundry at Cramp's is thoroughly organized. A metallurgical chemist has charge of mixing and melting the alloys; the clerical work and cost department is under the control of an accountant, while a practical foundryman looks after the molding floor and pouring operations. These three men are co-ordinate in their responsibility and they each report to the general superintendent who has charge of the gray-iron and steel foundries as well.

No matter how small a brass foundry may be it usually makes a number of alloys and the larger foundries turn out even a greater diversity. This is illustrated at the Cramp foundry which makes three kinds of white brass, three bearing bronzes, seven babbitt metals

FIG. 1—ONE OF THE TWO MOLDING FLOORS ON WHICH A WIDE RANGE OF WORK IS DONE—NOTE THE FLOOR MOLDING ON THE LEFT, THE TUBS IN THE MIDDLE AND THE BENCHES ON THE RIGHT

Fig. 2—Molding Floor on Which Loam Molds for Propellers are Made — Note the Pattern in the Foreground and the Molds in Different Stages of Completion.

Fig. 3—Pouring Floor and Cleaning Room, between the Molding Section to the Right and Reverberatory Furnaces to the Left—Two of the Mold Drying Ovens Can be Seen.

Fig. 4—A Section of the Cope of a Propeller Mold, with the Lifting Plates Illustrated at A and B.

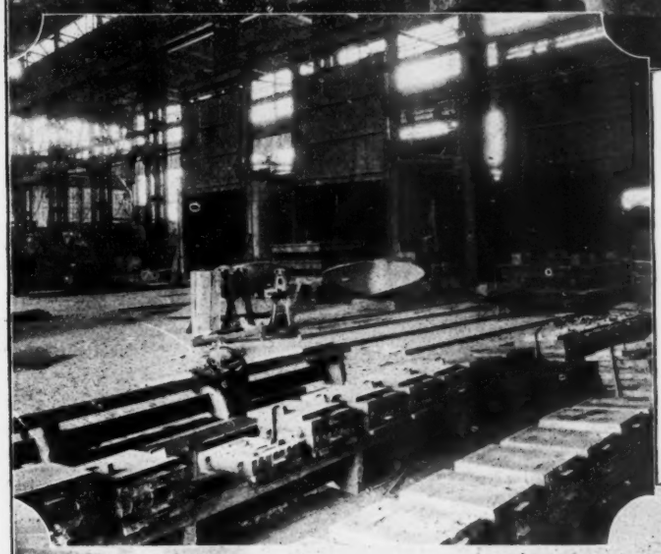


Fig. 5—The Drying Ovens are Located Between the Molding Section and the Pouring Floor—The Molds are Carried to the Ovens by Cranes and Run Through on Trucks.

Fig. 6—After the Cope Section is Removed the Drag is Smoothed Up and the Loam Allowed to Stiffen by Air Drying.

Fig. 7—The Molds are Torn Down Where They are Cast—The Bricks and Refuse are Separated and Carried Away in Dump Buckets—About 80 Per Cent of the Bricks are Salvaged.

and five metals for gears, besides red brass, yellow brass, type metal, gun metal, copper and tin alloys, nickel silver, aluminum bronze and other aluminum alloys, hydraulic metal, water-turbine bronze, steam-turbine bronze, magnesium alloy, phosphor-bronze, ordnance bronze, manganese-bronze and other alloys. The manganese-bronze, which is made under the Parsons patents as has been stated, differs slightly depending upon whether it is to be rolled, forged or put into castings.

To turn out this great variety of metals three melting mediums are employed, namely, crucibles, Schwartz furnaces and reverberatory furnaces. In one portion of the building served by two 5-ton cranes is the ingot foundry. It is equipped with a crucible furnace

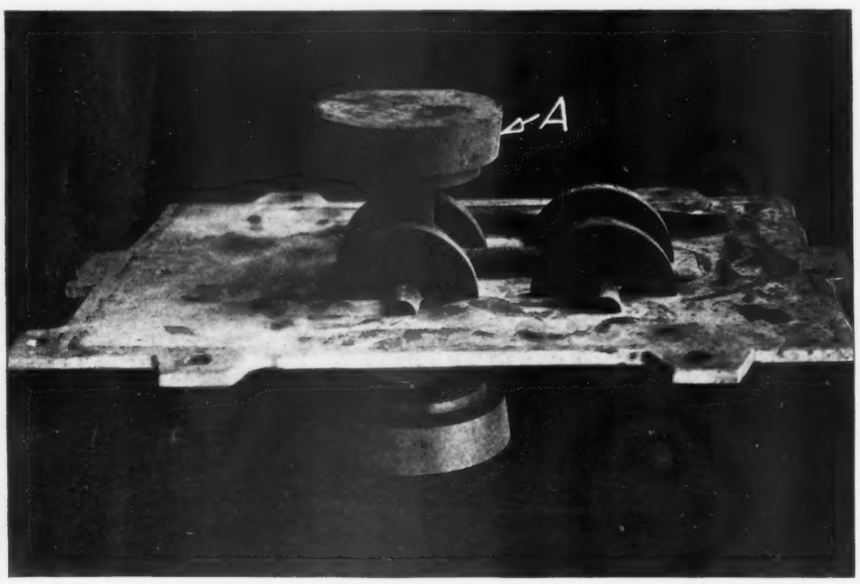


FIG. 8—A PATTERN MOUNTED ON A MATCH PLATE—FORMERLY CAST IN THREE-PART FLASK

of 12 holes, 1000-pound crucibles being employed. A portion of the special ingot metals made in this department are sold for general consumption. The Parson's manganese-bronze is also made up into ingots for remelting in the reverberatory furnaces. The manganese-bronze is cast into 1000-pound slabs approximately 4 inches thick. It is not possible to make this directly in the reverberatory furnace because the iron, which is added in the form of a special hardener alloy, would not become thoroughly mixed with the bronze in the bath of the furnace. When this bronze is made in crucibles the hardening metal is melted separately also in crucibles and poured into the main portion of the metal. It is possible in this way to obtain a uniform mitxure by stirring thoroughly in the crucible. Such a mixture could not be obtained in the reverberatory furnace on account of the shallow bath with its large surface.

For melting metal which goes directly into castings five crucible furnaces are located in different parts of the shop convenient to the various molding floors. These furnaces have a total of 64 crucible holes. They are used to melt small lots of alloys which would not require the use of a Schwartz furnace. Crucibles ranging from No. 100 to No. 175 are used.

The six Schwartz furnaces are located, like the crucible furnaces, at places most convenient for delivering the metal to the molds. Four of these furnaces are 42 inches in diameter with a melting capacity of 1200 pounds each. The two other Schwartz furnaces, which are 60 inches in diameter, will each melt 3200 pounds of metal at one time. All kinds of nonferrous alloys are melted in the Schwartz furnaces and it is thought that as good melting conditions are obtained in these furnaces as are secured in the crucibles.

Two large reverberatory furnaces serve to melt the metal for castings which are too large for the capacity of the Schwartz furnaces. Like all reverberatory furnaces the rated capacity varies considerably from their actual capacity. While rated at 30,000 pounds, as high as 42,000 pounds have been taken off at one heat. The average heat will run between 38,000 and 39,000 pounds. Eleven hours usually elapse between charging and pouring. As has been stated, metal charged into the reverberatory furnaces is first alloyed in crucibles in order to insure homogeneity. Slabs weighing 1000 pounds are charged through the furnace doors after being placed on peels with the aid of cranes. Heat is obtained from coal grates located at one end of each furnace.

There are two departments in which tub molding, bench molding and floor molding are done. One of these floors is shown in Fig. 1. Floor work can be seen to the left, the tubs are in the center and the benches are on the extreme right. The molders do nothing but mold, the flasks being shaken-out, the sand cut over and the metal poured by different gangs.

The benches are rigged up to take care of metal match-plates fitted with vibrators. This arrangement is proving so successful that the company is gradually shifting as much work as possible to match-plates. Three plates are shown in Figs. 8, 9 and 10. Fig. 10 shows a set of turbine-bucket blades, it represents the simplest type of casting put on metal match-plates in the Cramp shop. The dimensions of these castings must be extremely accurate and closer results have been obtained since the pattern has been placed on this style of match plate.

Fig. 9 shows a pattern which was formerly molded in a three-part flask. The sections *A* and *B* are now put in place similarly to *A* and the mold is rammed up and struck off on the plane of *A* and *B*. Then, when the sections *A* and *B* are removed, a cover core is placed over the top and the mold is filled with sand and turned over for drawing the pattern and setting the cores. The pattern shown in Fig. 8 is treated somewhat similarly except that *A* is a core print which is removed after the sand is rammed up to the top of it. The core is then placed and the mold filled.

Details of Propeller Molding

The heavier castings are molded in a bay, Fig. 2, which is served by two 15-ton cranes. In this illustration a number of loam molds for propellers are shown in different stages of completion. These molds are built on cast-iron bottom plates usually 10 feet 4 inches square. First, three brick piers are struck off on the plate and points marked on them at angles of 120 degrees apart to give the degree-point for each blade.

The spindle is next set up in the center and a seat swept up around it for the hub pattern. Complete solid patterns are seldom made because few large repeat orders are received. Also there is no saving in time by using a solid pattern as work on the mold must be discontinued at several stages during molding in order to allow the joints to stiffen.

As a general rule the pattern consists of the hub and one blade. This single blade pattern is swung on the spindle and the exact location for each blade is determined by the use of a plumb dropped from it to one of the

three piers built on the bottom plate. The correct angle for the blades is located by placing the plumbing rod in the same position relative to the pattern each time and adjusting the pattern until the plumb swings over the point marked on the pier.

The drag is molded first, one propeller section at a time. The leveling sticks are then lifted from off the pattern and the cope side is molded, as in the case of the drag, one blade at a time. After each blade is molded the cope part for that blade is lifted off with the crane and both the drag and cope are smoothed up by the molders. Fig. 6 shows a drag being smoothed up after the cope has been removed. One section of a cope after it had been removed from the drag is shown in Fig. 4. The lifting plates can be seen at the points *A* and *B*.

Drying the Molds

The molds are built in pairs and then prepared for the double end drying ovens. These ovens, which are located at one end of the heavy-molding section, face the pouring floor. A view of them with the molding floor in the rear is shown in Fig. 5. They are all 10 feet high. The longest one is 12 feet wide by 42 feet long while the widest has a span of 18 feet and a depth of 30 feet. Oil is used as a fuel and the temperature is measured by recording pyrometers furnished by the Bristol Co., Waterbury, Conn.

The molds are kept in the drying oven 21 hours and are then brought through to the pouring floor where two 25-ton cranes carry them to their proper position for pouring. Here they are encased in a cylindrical form build up of sheet-steel curbing. This casing stands about a foot from the mold. The intervening space is filled with sand tightly rammed by means of a special No. 9 rammer made by the Chicago Pneumatic Tool Co., Chicago. This rammer is quite large having a shoe 6 x 8 inches. On account of its size it is held by a jib crane and operated by one man.

Manganese-bronze for pouring the molds is taken from one of the reverberatory furnaces, both of which face the pouring bay. After the mold is poured it is allowed to cool until the metal is below 200 degrees Cent. It is then torn down on the floor where it was poured. The bricks which are fit to use again are separated from the refuse and both the good and bad ones are carried away by the crane in dump buckets. About 80 per cent of the bricks are salvaged. One of the molds in the process of being torn down is shown in Fig. 7. This illustrates the large shrink heads used, as the center is cut off close to the blade. A propeller with the riser cut off is shown in the foreground of Fig. 3.

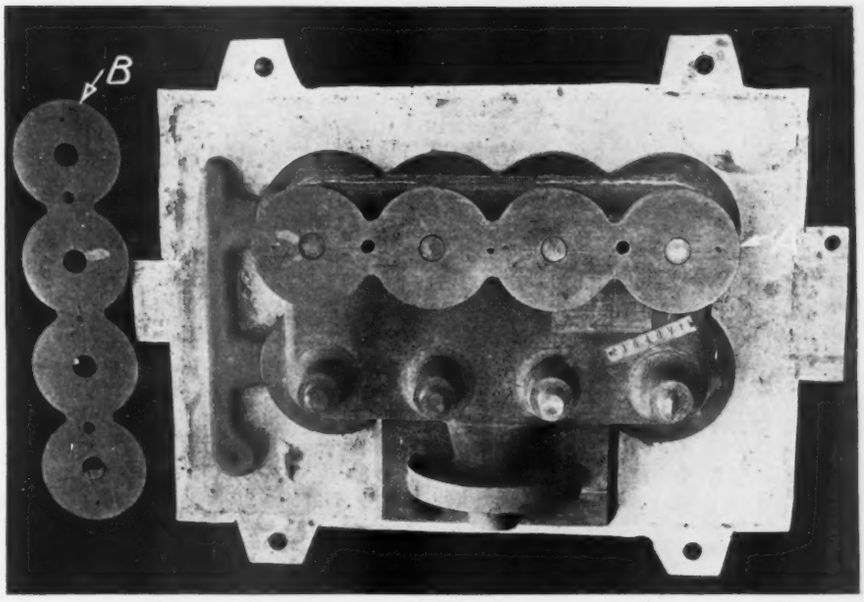


FIG. 9—THIS PATTERN IS CAST IN A TWO-PART FLASK WITH THE AID OF A COVER CORE

There is a considerable variation in the size of propellers, governed by the tonnage of the vessel for which they are designed and the type of engine operating them. The Cramp company has made twin-screw propellers for turbines as small as 3 feet in diameter while for reciprocating engines they have made propellers with a diameter as large as 18 feet 6 inches. The big propeller wheel for the LEVIATHAN required 83,000 pounds of metal for pouring; the shrink head weighed 14,000 pounds, or 17 per cent of the total.

The heads and risers are all cut off with band saws which have proved satisfactory for this work. These saws have a flexible back which prevents them from cracking. They are also fine toothed with 16 teeth to the inch.

The Cramp company carefully tests both the raw materials purchased and the finished castings. To do this a fully equipped physical and chemical laboratory is operated in connection with the several foundries. The physical laboratory is fitted with a 100,000-pound universal testing machine made by the Tinius Olsen Testing Machine Co., Philadelphia. On this machine many tensile tests are made. The metal from which the propellers are poured is carefully analyzed and the soundness of the metal is judged from the condition of the surface surrounding the hole which is bored through the center of the hub.

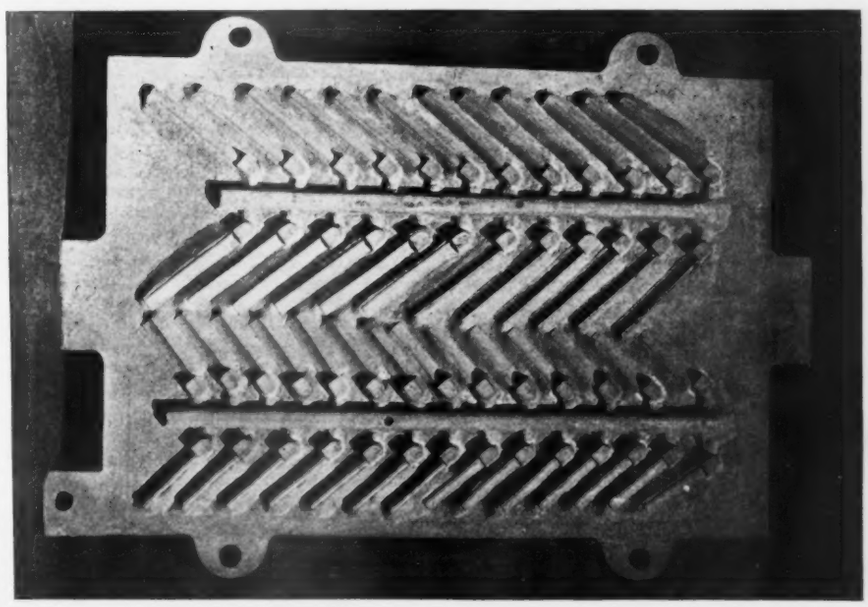


FIG. 10—A TURBINE BUCKET BLADE PATTERN—ONE OF THE SIMPLEST FORMS PUT ON A MATCH PLATE

The chemical laboratory is well equipped to take care of a quantity of alloy analyses. It has 10 electrolytic sets; four with rotating electrodes on which copper determinations can be made in half an hour, and six sets with stationary electrodes. One notable feature of the laboratory work is that oxygen determinations are made on every shipment of copper received. Normally lake copper contains less than 0.05 per cent oxygen and casting copper 0.10 per cent.

What You Will See at the Foundry Show

(*Concluded from page* 640)

represented by G. F. Danielson, G. F. Bateson, C. I. Anten, H. W. Jencks, G. F. Sparks and C. W. Close.

UNITED COMPOUND CO., Buffalo.—Vent wax and pattern wax will be exhibited; represented by John W. Bradley and L. F. Leney.

UNITED STATES GRAPHITE CO., Saginaw, Mich.—The booth occupied by this company will be fitted up as a rest room. Graphite and graphite products will be displayed; represented by R. A. Corrigan, J. G. Drought, F. B. Godard, H. F. Gump and G. D. Robinson.

U. S. MOLDING MACHINE CO., Cleveland.—The following machines will be exhibited: A plain air squeeze machine; combination jolt and squeeze machine; a combination jolt squeeze pattern draw machine; combination jolt squeeze stripping plate machine; a combination jolt stripping machine; a jolt roll over core machine, and a plain air jolt machine. These machines will be shown in operation; represented by J. N. Battenfeld, J. L. Battenfeld, C. F. Battenfeld and J. L. Murdock.

UNITED STATES SILICA CO., Chicago.—Samples of an abrasive for sand blasting and a form of silica for steel molding and core making; also samples of castings produced by these materials will be exhibited; represented by Volney Foster, Lewis B. Reed, H. F. Goebig and Oliver Cook.

VANDYCK-CHURCHILL CO., Philadelphia.—This company will exhibit a 3-foot sensitive radial drill with tapping attachment arranged for belt drive; a 5-foot triple purpose, plain arm, high duty radial drill equipped with speed-box and arranged for belt drive; a 3-foot triple purpose, high speed radial drill, motor driven; a 24-inch shaper, motor driven; a 16-inch tool room lathe, with complete equipment, belt driven; a 20-inch x 10-foot lathe, motor driven; a 30-inch x 30 x 8-foot planer, belt driven. These tools are manufactured by the American Tool Works Co., Cincinnati. The Vandyck company also will exhibit a motor-driven multiple milling machine made by the Kempsmith Mfg. Co., Milwaukee; a 16-18-inch motor-driven turret lathe, manufactured by the International Machine Tool Co., Indianapolis; a motor-driven universal grinder made by the Oakley Machine Tool Co., Cincinnati; a motor-driven cold saw manufactured by the Higley Machine Co., South Norwalk, Conn.; an exhibit of geometric threading tools and samples of work performed with these tools, manufactured by Geometric Tool Co., New Haven, Conn. As far as possible, the machines will be demonstrated on work; represented by C. M. Hamersly, Charles F. White, A. C. L. Black, J. K. Robson and George A. Crawshaw.

VIBRATING MACHINERY CO., Chicago.—This company will exhibit an electrically operated sand sifter and a gas unit for welding and cutting iron and steel with artificial or natural gas; represented by J. Schroeter, J. C. Miller and William Lindsay.

WILSON, T. A., & CO., Reading, Pa.—The booth occupied by this company will be equipped as a rest room for foundrymen. Safety goggles will be displayed; represented by M. C. Rider, E. A. Wagner, G. D. Richardson and N. Roy Miller.

WADSWORTH & CO., Cleveland.—Working models of tractor, crane and screen types of the new sand cutting machine being built by this company will be exhibited; represented by H. L. Wadsworth, George W. Beyerle and John L. Lake.

WADSWORTH CORE MACHINE & EQUIPMENT CO., Akron, O.—This company will exhibit a bushing core making machine; two motor-driven core cutting off and coning machines and steel reinforced core trays and bottom plates; represented by George H. Wadsworth and M. C. Sammons.

WALLACE, J. D., & CO., Chicago.—Woodworking machines including planers and complete equipment for a modern pattern shop will be shown; represented by J. D. Wallace and H. L. Ramsey.

WARNER & SWASEY CO., Cleveland.—This exhibit will consist of a universal hollow hexagon turret lathe operating on gear blanks and a universal screw machine operating on a special design of screw; represented by L. K. Berry, E. R. Gardner, H. E. Yeager and W. L. Loegler.

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.—Electrical equipment for foundries and machine shops, including steel-clad electrical heating devices for heating pattern plates, will be exhibited. The heaters are mounted in the space below the plates within the framework of the molding machine. A 500-ampere arc-welding motor generator set, with control panel and accessories, also will be exhibited. Industrial motors, starters and controllers, meters, fans and heating apparatus will be displayed.

WHITE & BRO., INC., Philadelphia.—Nonferrous metals of all kinds including casting copper, electrolytic copper, composition and bronze ingots, yellow brass ingots, manganese bronze, babbitt metals and other white metals; represented by Frank Krug, Raymond Hunter, Gillis Arsenault, G. Horace Krider, J. C. Ashmeads, F. A. Reinhardt, Harold F. Reinhardt and Ray Galbraith.

WHITEHEAD BROS. CO., New York.—The booth occupied by this company will be fitted up as a rest room; represented by Alfred J. Miller, Charles E. Andrews, Andrew Y. Gregory, Alexander Haigh, V. L. Whitehead Jr., R. L. Cleland, J. T. Kelly, R. J. Hashagen, T. F. Hogan and J. H. Whitehead.

WHITING FOUNDRY EQUIPMENT CO., Harvey, Ill.—This company will exhibit an operating model of a crane trolley; a round steel plate tumbling barrel; a turntable with grooved tracks; a 2-ton charging car; a 2-ton worm geared crane ladle and photographs and drawings of installations made by the company; represented by R. H. Bourne, A. H. McDougall, W. R. Hans and R. S. Hammond.

WHITMAN & BARNES MFG. CO., Akron, O.—This company will demonstrate a patented twist drill; represented by George Hine, R. A. Ammon, A. A. Williams and Ralph Templeton.

WOOD'S, T. B., SONS CO., Chambersburg, Pa.—Equipment used in connection with the system of taper snap molding employed by this company, including taper snap flasks and automatic snap jackets will be exhibited. A flask will be operated in connection with a power squeezer machine; represented by Charles M. Wood and Victor Lesher.

WOODISON, E. J., CO., Detroit.—Various types of molding machines, core machines and core oil, snap flasks, mold jackets and other foundry supplies will be shown; represented by E. J. Woodison, C. H. Woodison, J. C. Woodison, G. A. Burman, J. F. Webb, W. H. Muir, W. J. Wark, R. W. Davidson, J. M. Witters, M. A. Bell, R. S. Hoffman, W. H. Haggman, W. M. Burroughs, E. A. Mead, W. M. Maybank, H. T. Taylor, F. F. Shortsleeves, M. M. Werckman, D. D. Baxter, H. M. Chamberlin, J. W. Shotts and M. T. Thomson.

YOUNG BROTHERS CO., Detroit.—An oven compartment equipped with gas and electric heat will be exhibited. The method of heating by oil or coke also will be indicated. This oven will be arranged to handle cores on lift racks by means of a hand or power lift truck; represented by George A. Young, R. B. Reed, G. G. Parry, T. P. McVicker, W. C. Wagner and A. H. Ackermann.

German Zinc Trade

Zinc is one of the few raw materials of which Germany had an adequate supply during the war. The total German zinc output from home and foreign ores was: In 1918 about 280,000 tons, import about 56,000 tons, altogether about 336,000; export about 105,000, total 231,000. A considerable quantity of raw zinc was use by the German export trade and went abroad in the shape of half products and finished goods.

During the war German zinc smelting was almost entirely dependent on home supplies. The raw zinc output of the war raw material section was: In 1916 about 196,500 tons, 1917 about 186,500 tons, 1918 about 198,000 (to October). This fully covered war needs. At present the home zinc production exceeds the demand. Although the demand for zinc will increase with the resumption of normal economic conditions, and particularly the export trade, there will be no necessity for some time to come to import either zinc ores or the finished material.—*Deutsche Allgemeine Zeitung.*

Shrinkage Causes Trouble

By H. E. Diller

Question:—We are having trouble with some malleable-iron castings for steam-heating apparatus which leak when tested under air pressure. Our iron has a tensile strength of 40,000 to 45,000 pounds per square inch. Kindly let us know what is wrong and how to overcome it.

Answer:—The reason your castings leak when put under air pressure is that they are porous due to shrinkage. You can confirm this by breaking some of the castings and noting the fracture.

Such trouble can be remedied by making an iron which has less shrinkage and by the proper gating of the castings. Chills, discriminatingly used, may also be a help in overcoming the trouble. Possibly the design of the casting is defective and causes the shrinkage to draw at one spot. If such is the case the best remedy is to have the casting redesigned.

The Great Falls Iron Works, Great Falls, Mont., is erecting a new foundry, 100 x 150 feet, to produce gray iron, steel and brass castings. Miss M. Cerula Woodbury is president and treasurer of the company, A. I. Jones is vice president and secretary, and G. A. Bartle is superintendent of the foundry department.

The Wheeling Mold & Foundry Co., Wheeling, W. Va., has taken a contract for 300 tons of tunnel lining castings for the Lehigh Valley Ry.

Castings for Ship Construction-X

Accepted Foundry Methods for Molding and Casting Large Propeller Brackets, Together With the Necessary Precautions as to Drawbacks and Shrinkage Sections are Outlined

BY BEN SHAW AND JAMES EDGAR

WHILE the foundry work connected with making the propeller bracket described in the preceding article does not differ essentially from the previous one, yet many of the details and methods vary the construction of the mold. Rarely, indeed, are large numbers of castings of this description made to one design. The opinions held by designers vary as to the merits of different means of securing the bracket to the frame of the ship to secure desirable rigidity and maintaining the principles governing the formation of molds for steel castings. It will be noticed that the direction of each of the palms, the vertical center of the arms, and the center line of the boss vary. They are not in planes parallel to each other in any case. These naturally increase the difficulties with which the molder is confronted.

In some steel foundries large boxes are set into the foundry floor forming a framework to which the cope can be secured. Though this limits the size of work which can be molded to the surface area at the joint, it allows any depth required for the job. This method has advantages when the character of the work prevents rolling over the drag. It is, however, only in the large steel foundries which specialize in this particular class of work, that provision is made in such a manner for taking large work. In foundries where such work is only obtained occasionally, it is not considerd economical to give large spaces in the foundry floor to such boxes, even though smaller work could well be prepared in them.

Hence when large work similar in character to the propeller bracket is required in such foundries, the foundry floor is used for the drag and the cope box set upon the leveled floor. Weights must be lowered on the cope sufficient to give the necessary resistance against any tendency to lift.

In considering the preparation of the mold for this bracket it is necessary to make up the major portion of the mold in the floor. Bedding-in, in the ordinary way, is not desirable, because of the difficulty in handling such a pattern and also in maintaining its rigidity. Hence bearings are formed at a depth below the surface of the floor which will reduce the amount of top lift for any part, to the smallest amount. In this instance the pattern should be rammed up with the top of the palm *B* flush with the foundry floor. The bearings most convenient to make are those for the fishbacks to rest upon since they are in the same plane. The illustrations, Figs. 1 and 2, show the shape of the pit to be cut out of the sand, and the depth to accommodate the pattern.

A method for preparing the bearings is shown in Fig. 2. When these are formed they can be used as a guide for determining the depth of positions for the palms and boss. It is not possible to make these up exactly before setting in the pattern because of the bevels, but an approximate bearing can be made with the sand softened in order that an impression may be taken, when the pattern is lowered in place. Figs. 3 and

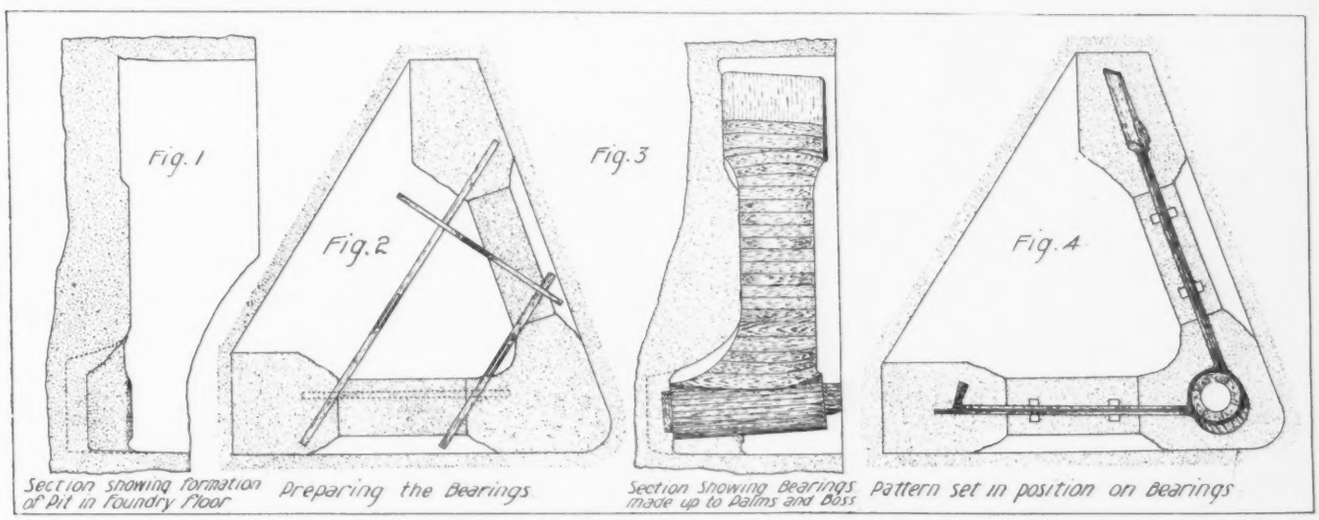


Fig. 1
Fig. 2
Fig. 3
Fig. 4
Section showing formation of Pit in Foundry Floor
Preparing the Bearings
Section Showing Bearings made up to Palms and Boss
Pattern set in position on Bearings

FIG. 1—SECTION SHOWING FORMATION OF PIT FOR MOLDING THE PROPELLER BRACKET FIG. 2—PREPARING THE BEARINGS FIG. 3—SECTION SHOWING BEARINGS MADE FOR PALMS AND BOSSES FIG. 4—PATTERN SET IN POSITION ON BEARINGS

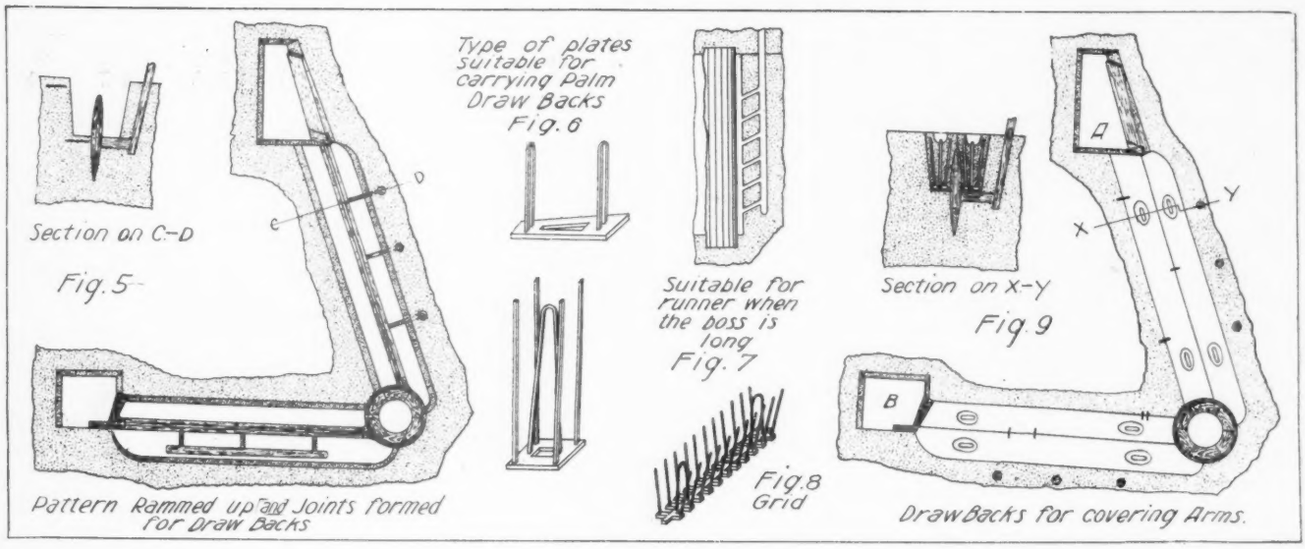

Section on C-D
Fig. 5
Pattern Rammed up and Joints formed for Draw Backs
Type of plates suitable for carrying Palm Draw Backs
Fig. 6
Suitable for runner when the boss is long
Fig. 7
Fig. 8
Grid
Section on X-Y
Fig. 9
Draw Backs for covering Arms.

FIG. 5—PATTERN RAMMED AND JOINTS FORMED FOR THE NECESSARY DRAWBACKS FIG. 6—TYPE OF PLATE RECOMMENDED FOR CARRYING THE DRAWBACKS FIG. 7—RUNNER FOR USE WHEN THE BOSS IS LONG FIG. 8—GRIDS FIG. 10—DRAWBACKS FOR COVERING ARMS

4 show the pattern set in position upon the bearings, bits of flat iron being laid upon them to prevent the pattern bedding itself in. The bearing for each palm is leveled off large enough to form drawbacks which are necessary for the successful removal of the pattern, and for free access to the mold after the pattern is removed. When setting large patterns of this type, instead of lowering them in complete, they frequently are assembled in the pit. In any case, whether this plan is adopted or not, the presence of a patternmaker or a representative from the "mold loft" is desirable to make final measurements, to insure as far as possible the correct relation between the various parts comprising the pattern. After it has been set on the bearings any discrepancy is rectified before starting to ram up.

When the pattern has been set it can be fixed with battens and supports set up for forming the joints of the drawbacks. The thickest part of the arms should be marked, to give a guide in forming the joint of the mold. Ramming may then be started.

It is best to ram up about the arms a little way first to give further support to the pattern and prevent any movement due to the force of ramming at any one place. However, consideration must be given to the shrinkage of metal forming the casting. The arm carrying the palm *A* offers no special difficulty and no provision need be made because the small shoulder is graduated by the large fillet connecting the palm with the arm. The shape and greater length of the palm *B* is quite different, and is liable to become misshapen and badly strained or even broken, unless some special means are adopted to allow shrinkage to take place, with as little resistance as is practicable. To meet the requirements a chain frequently is rammed up with the sand immediately behind the palm and covering a depth of about 12 inches, being worked round the joint, and carried to the surface of the mold in a similar manner to that explained in a previous article. This method is successful in many instances, when the disturbance of the sand near to the place where the greatest resistance will be given is sufficient to weaken the mold; but in this bracket the area of the mold forming the resistance is too great to rely upon this safeguard alone. If this method is used in conjunction with a specially prepared body of weak sand, good results will follow. The sand is weakened by the inclusion of a quantity of sawdust and used as a backing to the composite, which should be about 2 inches thick, at the place where the weak sand is used. This portion is rammed up near the sand carrying the chain so that after the job is cast and the chain withdrawn to loosen the sand, the heat having carbonized the sawdust allows the displacement of the mold and the shrinkage takes place without any serious effect upon the casting. A good backing of cinders fulfills a similar purpose, and is frequently used. The method adopted must weaken the backing sufficiently to allow for the shrinkage and contraction of the casting without interfering with the capacity of the mold yet must withstand the pressure of the metal while the mold is being filled.

The ramming of the mold can be carried on, making suitable provision for shrinkage as indicated, using about 1½ to 2 inches of composite against the pattern, and stiffening the sides near to the pattern with irons or gaggers at a convenient distance from

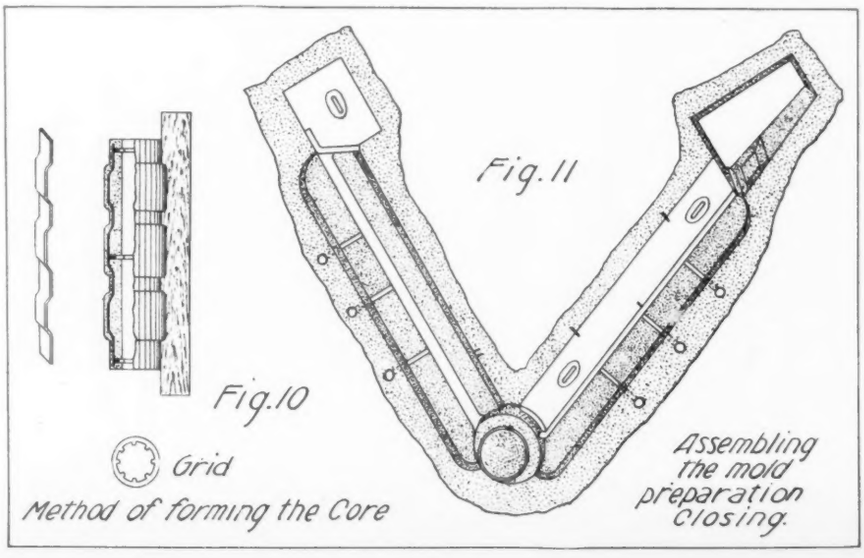


FIG. 10—METHOD OF FORMING THE SHAFT CORE FIG. 11—ASSEMBLING THE MOLD PREPARATORY TO CLOSING

DATA ON BELTS AND PULLEYS

By W. L. Tryon

VELOCITIES OF BELTS OR PULLEYS

All Pulley Diameters Given in Inches.

Dia. of Pulley	Velocity of Belt or Pulley in Feet Per Minute when Number of Revolutions Per Minute Are											
	100	110	120	130	140	150	160	170	180	190	200	250
2	52	58	63	68	73	79	84	89	94	99	105	131
2½	66	72	79	85	92	98	105	111	118	124	131	164
3	79	86	94	102	110	118	126	134	141	149	157	196
3½	92	101	110	119	128	137	147	156	165	174	183	229
4	105	115	126	136	146	157	167	178	188	199	209	261
4½	118	130	141	153	165	177	188	200	212	224	236	295
5	131	144	157	170	183	196	209	223	236	249	262	327
5½	144	158	173	187	202	216	230	245	259	274	288	360
6	157	173	189	204	220	236	251	267	283	299	314	393
6½	170	187	204	221	238	255	272	289	306	323	340	425
7	183	202	220	238	257	275	293	311	330	348	367	458
7½	196	216	236	255	275	295	314	334	353	373	393	491
8	209	230	251	272	293	314	335	356	377	398	419	524
8½	223	245	267	289	312	334	356	378	401	423	445	556
9	236	259	283	306	330	353	377	401	424	448	471	589
9½	249	274	298	323	348	373	398	423	448	473	497	622
10	262	288	314	340	367	393	419	445	471	497	524	655
10½	275	302	330	357	385	412	440	467	495	522	550	687
11	288	317	346	374	403	432	461	490	518	547	576	720
11½	301	331	361	391	422	452	482	512	542	572	602	753
12	314	345	377	408	440	471	503	534	565	598	628	785
12½	327	360	393	425	458	491	524	556	589	622	655	818
13	340	375	408	443	47.	511	545	579	613	647	681	852
13½	353	389	424	459	495	530	565	601	636	671	707	883
14	367	403	440	477	513	550	586	623	660	696	733	916
14½	380	418	456	494	531	569	607	645	683	721	759	949
15	393	432	471	511	550	589	628	668	707	746	785	982
15½	406	446	487	528	568	609	649	690	730	771	812	1015
16	419	461	503	544	586	628	670	712	754	796	838	1047
16½	432	475	518	562	605	648	691	734	777	821	864	1080
17	445	490	534	579	623	668	712	757	801	846	890	1113
17½	458	504	550	596	641	687	733	779	825	870	916	1145
18	471	518	565	613	660	707	754	801	848	895	943	1178
18½	484	533	581	630	678	727	775	823	872	920	969	1211
19	497	547	597	647	696	746	796	846	895	945	995	1244
19½	511	562	613	664	715	766	817	868	919	970	1021	1276
20	524	576	628	681	733	785	838	890	943	995	1047	1309
21	550	605	660	715	770	825	880	935	990	1045	1100	1375
22	576	634	691	749	806	864	921	979	1037	1094	1152	1440
23	602	662	723	783	843	903	963	1024	1084	1140	1204	1505

(*Continued on Data Sheet No.* 302)

Note—This sheet may cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

DATA ON BELTS AND PULLEYS

By W. L. Tryon

VELOCITIES OF BELTS OR PULLEYS

(*Continued from Data Sheet No.* 301)

Dia. of Pulley	Velocity of Belt or Pulley in Feet Per Minute when Number of Revolutions Per Minute Are											
	100	110	120	180	140	150	160	170	180	190	200	250
24	628	691	754	817	880	943	1005	1068	1131	1194	1257	1571
25	655	720	785	851	916	982	1047	1113	1178	1244	1309	1635
26	681	749	817	885	953	1021	1089	1157	1225	1293	1361	1702
27	707	778	848	919	990	1060	1131	1202	1272	1343	1414	1767
28	733	806	880	953	1026	1100	1173	1246	1319	1393	1466	1833
29	759	835	911	987	1063	1139	1215	1291	1366	1443	1518	1898
30	785	864	942	1021	1100	1178	1257	1335	1414	1492	1571	1964
31	812	893	974	1055	1136	1217	1299	1380	1461	1542	1623	2029
32	838	922	1005	1089	1173	1257	1340	1424	1508	1592	1676	2094
33	864	950	1037	1123	1210	1296	1382	1469	1555	1641	1728	2170
34	890	979	1068	1157	1264	1335	1424	1513	1602	1691	1780	2225
35	916	1008	1100	1191	1283	1375	1466	1558	1649	1741	1833	2291
36	943	1037	1131	1225	1320	1414	1508	1602	1697	1791	1885	2356
37	969	1066	1162	1259	1356	1452	1550	1646	1744	1840	1937	2421
38	995	1094	1194	1293	1393	1492	1592	1691	1791	1890	1990	2487
39	1021	1123	1225	1327	1429	1532	1634	1736	1838	1940	2042	2552
40	1047	1152	1257	1361	1466	1571	1676	1780	1885	1990	2094	2618
41	1073	1181	1288	1395	1503	1610	1718	1825	1932	2039	2147	2684
42	1100	1210	1319	1429	1539	1649	1759	1869	1979	2089	2199	2749
43	1126	1239	1351	1463	1576	1689	1801	1914	2026	2139	2252	2815
44	1152	1267	1382	1498	1613	1728	1843	1958	2073	2189	2304	2880
45	1178	1295	1414	1532	1650	1768	1885	2003	2120	2139	2356	2946
46	1204	1324	1445	1566	1686	1807	1927	2047	2167	2288	2409	3011
47	1231	1353	1477	1600	1723	1846	1969	2092	2214	2338	2461	3077
48	1257	1382	1508	1634	1759	1885	2011	2136	2262	2388	2513	3142
49	1283	1411	1539	1668	1796	1925	2053	2180	2309	2438	2565	3208
50	1309	1440	1571	1702	1833	1964	2094	2225	2356	2487	2618	3273
51	1335	1469	1602	1736	1870	2003	2136	2270	2403	2537	2670	3338
52	1361	1497	1634	1770	1906	2042	2178	2314	2450	2587	2723	3403
53	1388	1526	1665	1804	1943	2082	2220	2359	2497	2637	2775	3469
54	1414	1555	1696	1838	1979	2121	2262	2403	2545	2686	2827	3534
55	1440	1584	1728	1872	2016	2160	2304	2448	2592	2736	2879	3600
56	1466	1613	1759	1906	2053	2199	2346	2492	2639	2786	2932	3665
57	1492	1642	1791	1940	2090	2239	2388	2537	2686	2836	2984	3731
58	1518	1670	1822	1974	2126	2278	2429	2581	2733	2885	3037	3796
59	1545	1699	1854	2008	2163	2317	2471	2626	2780	2935	3090	3862
60	1571	1728	1885	2042	2199	2356	2513	2670	2827	2985	3142	3927
62	1623	1786	1948	2110	2273	2435	2597	2759	2922	3084	3246	4058
64	1676	1843	2011	2178	2346	2513	2681	2848	3016	3183	3351	4189
66	1728	1901	2074	2246	2419	2592	2765	2937	3110	3283	3456	4319

(*Continued on Data Sheet No.* 303)

THE FOUNDRY DATA SHEET, SEPTEMBER 15, 1919
Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

the bottom, as shown in the section C, D of Fig. 5. It will be noticed that the thickest part of the arms is at little more than half of their depth and it is along the guide lines marked at this part, that the joint requires to be made. Runners should be bedded in after the bearing for the joint has been sleeked over and connecting gate sticks set when the remainder of the drag mold can be rammed, leaving sufficient room to give body to the cover.

The method of running the job varies according to the general design of the bracket, but in general practice, when the boss is not much deeper than the arms, and the connection between them is a gradual changing shape, the metal is supplied by way of the arms as shown in Fig. 5. However, when the boss is long, it is better to supply metal to the boss direct, and for this purpose a gate connected with a series of runners in the form of a spray is suitable, as indicated in Fig. 7. It is not necessary that these runners should deliver metal all together, the idea being that hot metal can be supplied to the top rather than being forced up from the bottom, therefore the runners forming the spray should have a greater area, in the aggregate, than the gate. When a quantity of metal has been supplied, depending upon the depth of the boss below the arms, an additional supply of metal should be provided by way of the arms so that the temperature may be maintained. In Fig. 9 the gates are independent of each other, being connected afterwards by the feeding trough or basin. When this method is adopted considerable difficulty is often experienced in setting them to clear the bars in the cover box. To overcome this, the recess forming the joint is sometimes made wider on the outside of the arms, to make room for a connection between the runners, so that one gate to each arm will suffice, as illustrated in Fig. 5.

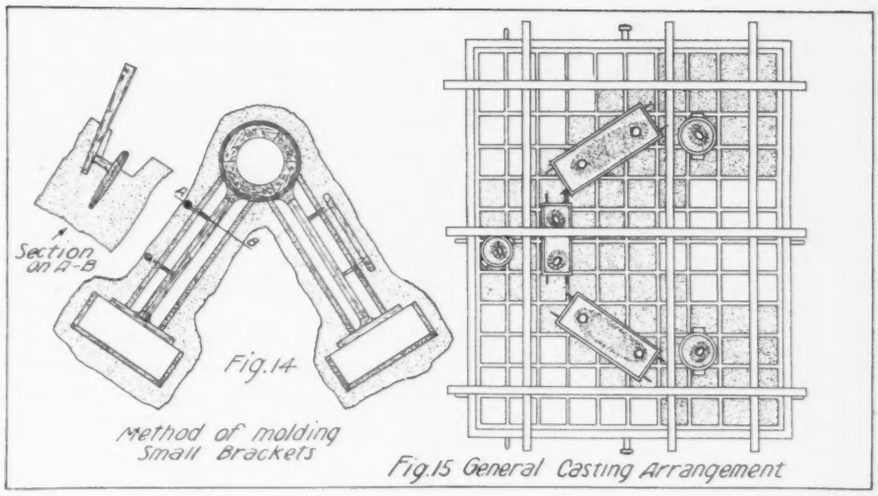


FIG. 14—METHOD FOR MOLDING SMALL BRACKETS FIG. 15—GENERAL CASTING ARRANGEMENT FOR SMALL BRACKETS

Making the Drawbacks

Having worked up the joint to the surface of the mold as shown in Fig. 5, the drawbacks for the palms can be rammed up. Two plates are shown in Fig. 6, which are suitable for carrying the drawbacks, that for carrying the drawback A having a number of prods cast with the plate and lowered in on to a bed of composite. The plate for drawback B shows four iron bars cast in at the corners. These serve as a support for loose pieces of grid to which they can be wired. The pieces are fixed in as the ramming proceeds.

It is necessary to loosen the pattern during the ramming and take all precautions to facilitate its removal from the sand. All screws holding loose pieces should be removed. It saves the molder much time if round-headed screws are used for these loose pieces, and the heads left above the surface of the pattern. Owing to the depth of the lift over the top of the arms it is not good practice to attempt to carry it with the cope; it is preferable to cover them separately and make up a surface for the top flask, level with the top of the palm B, and dropped to leave the edge of the palm A and the surface of the boss, so these can be carried in the cope. As illustrated in Fig. 9 the covers or drawbacks for the arms are divided in a line with the vertical centers of the arms for convenience, but with shallower lifts they can be made in one piece over each arm. A suitable grid for carrying each of these drawbacks is shown in Fig. 8. Grids of this type bedded into a covering of composite allow free access to the top for ramming up the drawbacks. The drawback directly behind the palm B requires careful manipulation. Although it should be strong enough to permit a lift without risk, it should be so constructed that it will crush under the strain of contraction, without materially affecting the casting. The grid should allow ample clearance and ashes should be used to weaken the drawback. Thin webs are sometimes cast on thus connecting the palm with the arm in such instances, because the metal forming the palm is considerably lighter in section than the arm, and will naturally solidify more quickly. Hence the shrinkage of the metal in the arm being later tends to cause a bending action at the junction between the two, and the casting becomes distorted. These webs offer a resistance to this action and are much favored by many steel foundrymen. However, if the mold forming the back of this

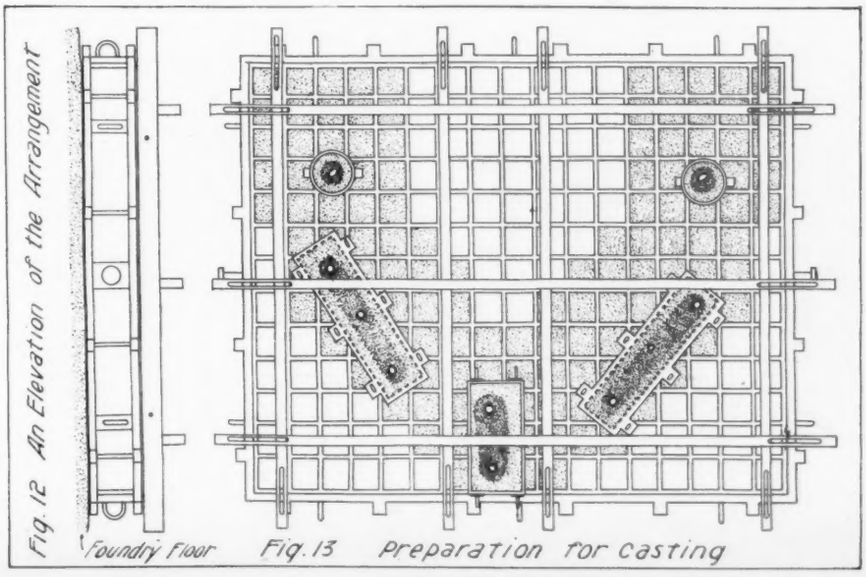


FIG. 12—ELEVATION SHOWING THE COPE FLASK IN PLACE FIG. 13—PLAN VIEW SHOWING THE COPE SET AND ARRANGEMENT OF RUNNER BOXES

palm is sufficiently weak to give under the strain the webs may be neglected.

When these drawbacks have been formed and the joint made up, a plain flask large enough to take the cope may be lowered in place. The type shown in Figs. 12 and 13 usually is standard for work of this class, and is suitable for various shapes. Only that part of the flask covering the job need be rammed.

Risers should be set on each palm and two or three on the top of the boss. Since there is a drop to the surface of the boss and the palm *A*, gaggers should be used freely to insure a good lift.

After successful ramming of the cope, the work of dissembling the mold can be commenced. The cope flask is removed and the pattern of the boss is withdrawn, then the drawbacks, which should have distinguishing marks made upon them, are lifted out. In withdrawing the remainder of the pattern, the molder, having paid particular attention to the method of construction, will draw the palm *B* into the opening left by its drawbacks, and then out of the mold altogether. The fillets connecting the arms with the boss will be withdrawn in a similar manner. The smaller loose pieces attached to palm *A* having been lifted into its drawback, both arms can be withdrawn without further delay. The surface of the mold should be well nailed and sleeked over, the runners made clear and sharp corners eased off, the whole mold being dried.

The shaft core can be satisfactorily swept up on a horizontal spindle, and the spindle afterwards removed. The requisite stiffening to the core is given by three cast iron rings, to which are wired a number of pieces of iron, shaped to suit the profile of the core, as shown in Fig. 10. These pieces of iron are bedded into the composite forming the core until they come into contact with the grids, when they are secured and the core revolved against the board for final sweeping.

When the mold, drawbacks and core are thoroughly dried, they should be painted after having carefully examined the mold and filled any cracks which may be present. The work of assembling the mold will take considerable time, and care must be exercised to get the various pieces in their correct relative positions. Fig. 11 gives a general view of the finished mold being assembled.

About the fillets and along the thicker portion of the arms nails are frequently driven into the sand, leaving a large part of them projecting into the mold. These act as chills and assist in solidifying the metal more regularly. They thus prevent the tendency to draw upon the thicker parts of the casting. When the job is assembled and the cope lowered, gate and riser heads are prepared, dried, coated with tar and grouted into their relative positions on the cope, as shown in Fig. 13. Preparation is made for casting by securing against a possible lift. The illustrations, Figs. 12 and 13, show a method used when the job is cast in the foundry floor, without a drag flask. If a box is bedded in the floor, then bolts and clamps can be used together with the iron beams shown. After the metal has been cast, feeding should be resorted to by way of the risers, and easing should commence as soon as the metal is solid.

The small bracket which is attached nearer to the hull of the ship, being near to the entrance of the propeller shaft to the shell, is usually of the type shown. The arms are the fishback design, and the method of molding is similar to the foregoing example. The varying angles of boss and palms raise difficulties in the successful removal of the pattern. Fig. 14 shows the general practice in forming the joint in such instances. When the depth of the arm from the joint is too great for convenience in successfully sleeking the mold, then the central portion between the arms is lifted as a drawback, but whenever possible the method illustrated is adopted because less time is occupied on the work. The general casting arrangement is shown in Fig. 15 which shows three risers off the boss, two of these assist in feeding the junction between the arms and the boss.

Protest Rates on Defective Castings

An emphatic protest has been filed with the railroad administration against a recent ruling of the official classification committee concerning freight rates on returned defective castings and forgings, by founders throughout the country. Malleable foundrymen have taken the lead and are expected to carry to a finish the fight to rescind the order.

The order which recently was issued makes the freight rate on such material the same as that on perfect castings and forgings, where heretofore this material was classed as scrap and therefore shipped under scrap freight rates. The order follows:

"This committee has just given careful consideration to the question of rating properly applicable on return defective castings or forgings. A common practice among manufacturers, which seems to be spreading, is for the manufacturer of machinery or iron or steel articles, to contract with the foundry or steel mill for supply of rough castings or rough forgings, the contract providing that the castings or forgings in which imperfections are discovered during the machining process, shall be returned to the maker, who upon examination and finding of the defects will credit the purchasers with the purchase price. It is generally impracticable for the manufacturer who has discovered defects in such articles, to break them in order to reduce them to a condition in which they would unquestionably be rated as scrap iron or steel, such breaking interfering with the examination to be made by the maker on return. Such articles, however, have in fact generally a value only as scrap iron or steel and are of no use whatever except for remelting. Owing to the peculiar conditions under which they are returned, however, they retain a value as castings or forgings until the maker has verified the defects found by the purchaser.

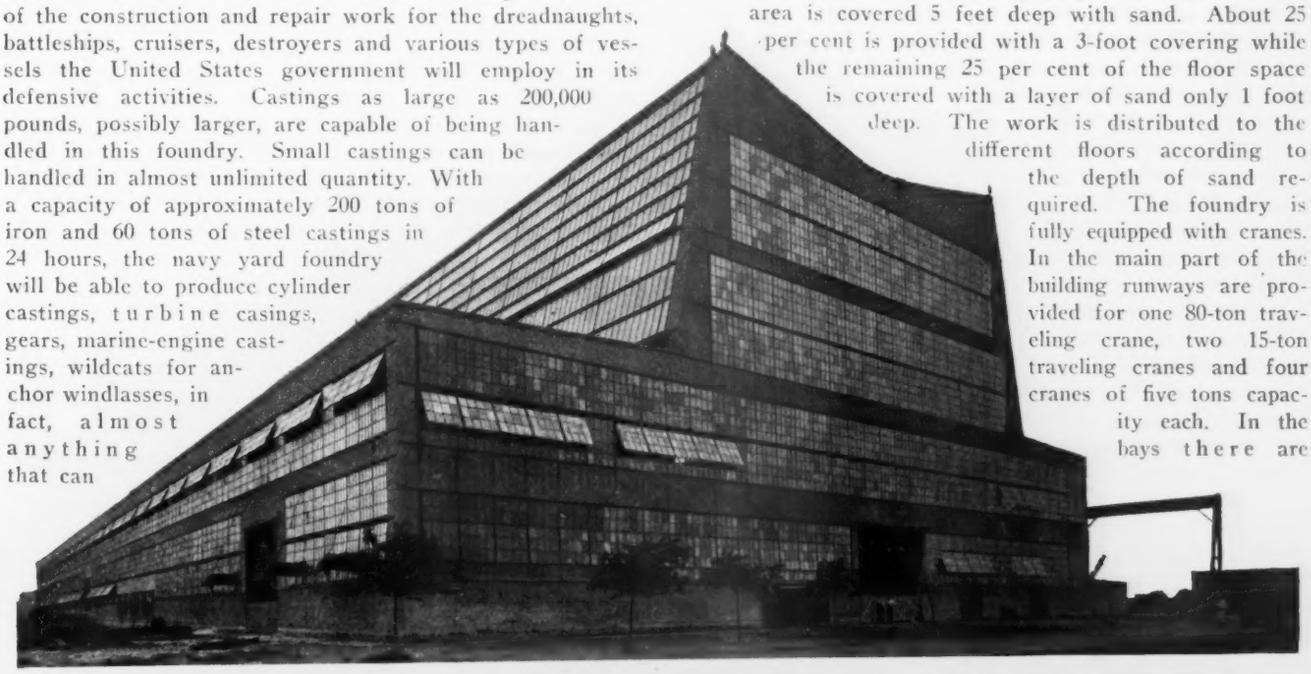
"This condition throws upon the carriers the responsibility which they would have in transportation of the original article and we, therefore, decline to view such articles as being entitled to the scrap iron or steel rating. On the other hand any work which the purchaser may have expended upon the article is absolutely lost. Owing to the defect discovered the work has added nothing whatever to the value and we feel that it has not really advanced the article beyond the casting or forging state. We have, therefore, ruled that such articles handled under the circumstances described, are ratable on their return journey as castings or forgings and have advised shippers to describe them on their bills of lading as defective castings or defective forgings. This ruling has been given directly with respect to castings returned by the Ellicott Machine Corp., Baltimore, to the York Foundry & Machine Co., York, Pa.; defective castings returned to manufacturers by the Hudson Motor Car Co., Detroit, and defective forgings returned by the New Process Gear Co., Syracuse, N., Y., to the Richmond Forgings Corp., Richmond, Va.

"We have also held that articles of iron or steel which have been originally shipped as finished articles, such as piston rods, and are found to be imperfect, are upon their return journey to the manufacturers, ratable the same as the new articles in a supposedly perfect condition."

Government Builds Model Foundry

New League Island Foundry Will Make Gray-Iron and Steel Castings for the Navy—Splendid Building Erected and Modern Equipment Installed—Electric Furnace is Provided

PERHAPS the largest foundry for the production of marine castings in the United States, if not in the world, is that which is just being completed in the navy yard at League Island, Philadelphia. It represents an investment of approximately $1,145,000 in the building alone. The added cost of the equipment and appliances, swells the total to close to $1,500,000. The navy may well be proud of this plant which in the future will turn out the castings for much of the construction and repair work for the dreadnaughts, battleships, cruisers, destroyers and various types of vessels the United States government will employ in its defensive activities. Castings as large as 200,000 pounds, possibly larger, are capable of being handled in this foundry. Small castings can be handled in almost unlimited quantity. With a capacity of approximately 200 tons of iron and 60 tons of steel castings in 24 hours, the navy yard foundry will be able to produce cylinder castings, turbine casings, gears, marine-engine castings, wildcats for anchor windlasses, in fact, almost anything that can be made of iron or steel. The foundry is 642 feet long and 160 feet wide, with a central bay 60 feet in width, and two side bays, in one of which the cupolas are located. From molding floor to peak of roof, the distance is 97 feet. Fully 90 per cent of the wall space consists of steel-framed sash windows, providing ample light even on dark days. The building proper is of concrete and steel-frame construction. The floor is practically all of Lumberton sand. Approximately 50 per cent of the floor area is covered 5 feet deep with sand. About 25 per cent is provided with a 3-foot covering while the remaining 25 per cent of the floor space is covered with a layer of sand only 1 foot deep. The work is distributed to the different floors according to the depth of sand required. The foundry is fully equipped with cranes. In the main part of the building runways are provided for one 80-ton traveling crane, two 15-ton traveling cranes and four cranes of five tons capacity each. In the bays there are



VIEWS OF THE EXTERIOR AND INTERIOR OF THE LEAGUE ISLAND FOUNDRY—NOTE THE HIGH MONITOR ROOF AND THE DISTANCE IT ALLOWS THE CRANEWAY TO BE RAISED ABOVE THE MOLDING FLOOR

two 10-ton cranes and one 15-ton crane and in the foundry yard there is another crane of 10 tons capacity. In conjunction with the cranes, 36 industrial cars are operated by tractors over a total of 2700 feet of industrial tracks laid on concrete foundations. In various parts of the system of tracks, which traverses the building and the yards about it, there are 26 turntables. This system provides for ready handling and movement of all the products of the foundry.

A particularly impressive feature of this new navy plant is found in the series of concrete bins for storing various materials, which extend the full length of the building on the north side facing the foundry yard. These bins have a total capacity of approximately 5000 tons. The bins are filled by means of the yard crane which drops the material, chiefly sand, into the bins through top hatches. Access to the bins, to obtain needed materials, is from the foundry proper. In addition to these bins, a large bin separate from the main building is provided. It is in the foundry yard and is used for storing coke. It has a capacity of 600 tons.

Inside the building, immediately adjoining some of the bins, is a mezzanine floor with receiving balconies projecting from it. The yard crane also serves these balconies, to permit handling materials from car to cupola. The mezzanine floor is equipped, in addition to industrial tracks, with an overhead monorail trolley system provided with transfer sections. All hoists on the trolley are of the electric type. The industrial tracks, which serve the cupola charging section of the mezzanine, run directly from the material balconies across weighing scales to the cupolas.

When completed, the foundry will have four cupolas. Two are now in place and the other two are ready to be installed. The two in operation are the largest, one of 96 inches diameter, with a capacity of 27 tons per hour, and the other 80 inches diameter, melting 23 tons per hour. One of those yet to be installed has a diameter of 60 inches and a capacity of 14 tons and the smallest is 42 inches in diameter and melts six tons an hour. This battery of cupolas will be able to furnish 70 tons of melted iron per hour. The cupola stacks are 104 feet high.

The foundry is at present operating an electric furnace for melting steel for castings. This furnace melts three tons of steel in three hours. Current is brought to the furnaces at 2300 volts and stepped down by transformers to slightly over 100 volts. Foundations have been laid for two additional arc furnaces, each of six tons capacity.

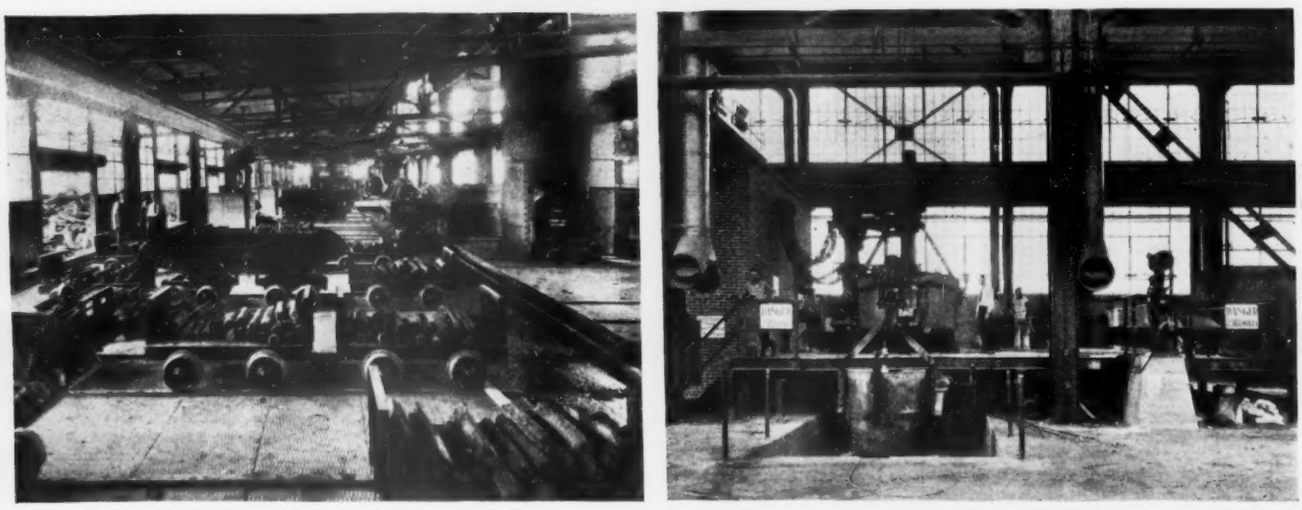
There is a battery of four core ovens in the foundry, two each 36 feet by 18 feet 6 inches, and two each 20 feet by 10 feet 6 inches. All the ovens are 16 feet high. These ovens are fired on the underdraft principle with hard coal. There is also a core oven for baking the smaller cores.

In the north bay there are eight steel combination coremakers' tubs and benches, each unit providing working space and sand storage for four coremakers. A section of the mezzanine floor also will be used for making small bench molds, cores, etc., an electric elevator serving the floor from the molding floor proper. An annealing furnace, 20 feet long and 8 feet wide is provided for annealing all types of castings. The furnace is heated on the overhead principle and is equipped with eight oil burners which develop a heat of 1800 degrees Fahr.

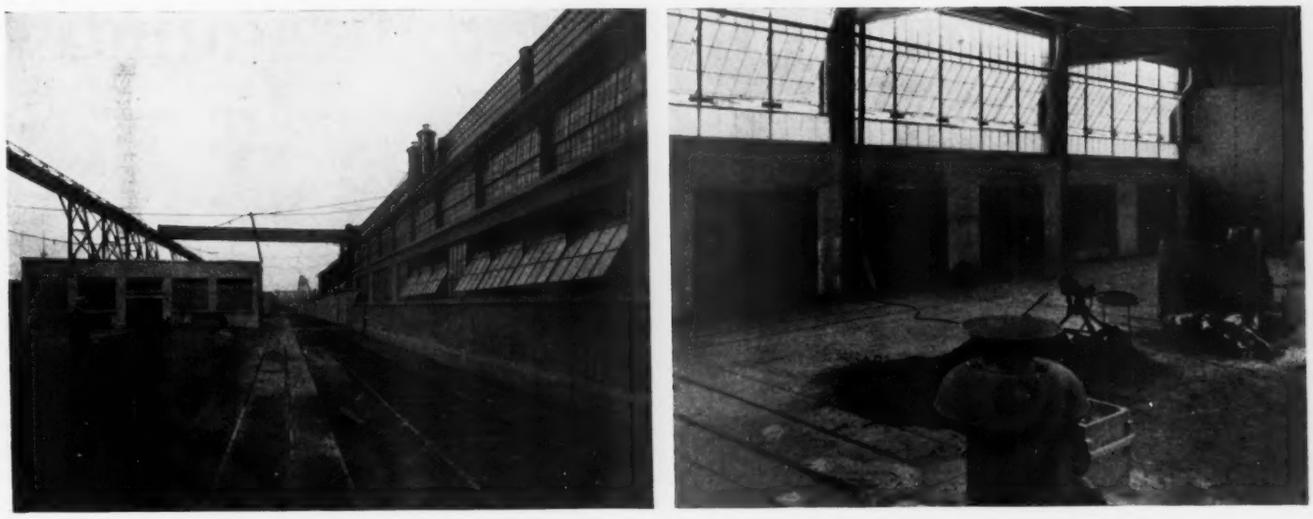
In the foundry proper are three casting pits. All of these pits are 9 feet deep. One is 30 feet square, another is 30 feet by 20 feet, and the third is 30 feet in diameter. Three molding machines of the larger type have been installed, together with four smaller ones. There are three sand-mixing machines, one clay mixing machine, one wire-straightening machine, one sprue-cutting machine, three grinders, and one 36-inch cold saw.

A complete sand-blast equipment has been installed for cleaning castings. This equipment consists of two sand-blasting rooms with air-suction ducts to eliminate dust. The sand is carried through a series of linen screens which catch and accumulate all dust which is then conveyed outside the building, where it is dumped into a suitable receptacle. The sand-blast rooms can accommodate very large castings, one room being 16 feet square. In addition to the rooms, there is a sand-blast barrel. Two tumbling barrels also are provided.

A pattern room, 40 feet square, is located in one corner of the building.



THE CHARGING FLOOR IS SHOWN TO THE LEFT—NOTE THE HEIGHT THE CUPOLA EXTENDS ABOVE THE CHARGING FLOOR AS SHOWN IN THE UPPER ILLUSTRATION—TO THE RIGHT IS SHOWN THE ELECTRIC FURNACE FOR MAKING STEEL



A CRANE OVER THE STOCKYARD FACILITATES HANDLING MATERIALS AND PUTS THE SAND INTO THE STORAGE BINS

This is a fireproof, steel structure. From this room all patterns are issued to the foundry. As the jobs are finished in the foundry the patterns are returned to this room to be checked off before being sent to the main pattern storage. The carpenter shop, for building and repairing flasks, is in a separate building located in the flask yard. This shop is fully equipped for the work of the foundry. Three office rooms 24 feet square are provided in the foundry building, on the south side, while on the north side are the locker room, toilets and wash rooms. These features are modern in every detail and are so located that the men have easy access to them.

The building is heated by a hot-air heating system consisting of six units, each independent of the other. In the summer cold air is supplied through these units.

Melting an All-Scrap Charge in the Cupola

By H. E. Diller

Question:—We have a large stock of good scrap iron and would like to use this without pig iron. Please let us know the best way to do this. We would prefer to soften the metal by adding ferrosilicon to the ladle.

Answer:—We would not recommend the use of ferrosilicon in the ladle as it is difficult to get a homogeneous mixture in this way. Beside this the ferrosilicon added to the metal in the ladle would tend to cool it somewhat. We would prefer to add the silicon to the charge in the cupola in the form of ferrosilicon. Your iron will lose 0.20 per cent silicon on being melted in the cupola. Therefore you will have to make up this 0.20 per cent silicon in order to obtain iron containing the same amount of silicon as the scrap you put in.

The accompanying table shows how to calculate this and also the amount of 5 per cent, 10 per cent and 15 per cent ferrosilicon respectively which would be required to raise the mixture 0.20 per cent in silicon. The table is figured with scrap having 2 per cent silicon, but no matter what percentage of silicon there may be in your scrap, the table would hold good for computing the amount of ferrosilicon necessary to make up for the loss of silicon in the cupola.

Pounds Metal		Per Cent Silicon	Silicon
935 scrap	X	2	1870
65 ferrosilicon	X	5	325
1000 total			2.195%
975 scrap	X	2	1950
25 ferrosilicon	X	10	250
1000 total			2.200%
985 scrap	X	2	1970
15 ferrosilicon	X	15	225
1000 total			2.195%

Not only will it be necessary for you to make up the amount of silicon lost in the cupola but you will have to be careful of your melting practice and make certain that you have enough coke in the bed and between the charges to prevent oxidation of the metal. We would also recommend the use of 1½ pounds of fluorspar to a ton of metal in the cupola, and the addition in the ladle of 3 pounds pea-size, 80-per cent ferromanganese to a ton of metal. The ferromanganese addition is recommended to help take care of any high amount of sulphur which is apt to be in the scrap iron.

It might be well to drop the amount of pig iron in the mixture a little at a time instead of starting off with an all-scrap mixture. In this way you can watch the change from day to day and correct any faults which you may find in the melting practice, instead of starting with a full charge of scrap metal and getting into difficulties before you are able to thoroughly control your cupola practice.

Moline Iron Works is Organized

C. J. and H. W. Cooper retired from active management of the H. W. Cooper Saddlery Hardware Manufacturing Co. at the annual meeting held in Moline, Ill., July 21. The original company was organized by the Cooper brothers in Chicago in 1879 and has been in continuous operation since. The business was moved to Moline in 1888 and was improved and enlarged in 1908 by the erection of a malleable iron foundry.

At the recent meeting the stockholders decided to change the name of the company to the Moline Iron works and to double the present capacity. Suitable buildings are to be erected at once, the first unit to be a malleable iron foundry with two furnaces. To take care of these proposed extensions, the capital stock is to be increased to $500,000. The following officers were elected for the ensuing year: President, L. E. Nutt; vice president, J. J. Creedon; treasurer, J. T. Miles; secretary, L. H. Dorman.

The baseball park of the Moline Three-I league has been purchased recently. The purchase of this site will allow additional expansion which is contemplated by the company. Work will be started at once on the construction of a malleable foundry 110 x 400 feet and an enameling and finishing building 110 x 360 feet. P. H. Lorenze, Moline, has been awarded the contract. The product of the Moline Iron Works will include automobile, truck, tractor, agricultural implement, washing machine and other miscellaneous castings.

Special Rig for Continuous Foundry

Four Machines Make Molds With Green-Sand Cores for Tractor Transmission Housings—Floor Space Saved by Pouring as Soon as Molds are Finished and Shaking Out While Hot

WHEN we consider the advances made in the development of labor saving machinery in recent years, it may seem strange that automatic machinery is not used more extensively in the foundry industry. The explanation for this peculiar state of affairs may be found partly in the fact that a great many castings are individual and are never repeated; others are made only intermittently and others again are not made in sufficient quantities to warrant the installation of special machinery for their production.

Where similar castings are made in large quantities, however, installations of automatic appliances are becoming more and more numerous and the foundry executives are proving themselves, in this respect, no whit behind their contemporaries in other industrial lines. Indeed, when we consider the many and complex factors entering into the production of castings, it will be admitted that foundrymen are alert and progressive to take hold of all mechanical means to advance their work.

Under ordinary circumstances it is necessary to provide floor space and to stock a sufficient number of flasks to accommodate all the work made for each day's cast. One of the first problems therefore, which confronted those who wished to secure a larger output in a given length of time was to find a way of doing so without increasing the number of flasks or providing a larger floor space. The logical solution was to provide a continuous pouring and molding system so that the flasks could be released and returned to the molding floor as soon as the castings were poured. This system is now in operation in most of the foundries engaged in repetition work.

Having satisfied themselves that the system was practicable the foundrymen then directed their energies to devising methods to keep the pouring side of the proposition working to capacity. On plain, straight work this feature presented no unusual difficulties; but on large complicated jobs, those for instance which were completely cored out, special treatment and equipment were required.

A successful method of producing tractor transmission housings entirely in green sand has been designed and patented by S. W. Stoney, foundry superintendent of the Ferro Foundry & Machine Co., Cleveland. It has been installed at the company's plant under the direction and supervision of S. W. Seblin, plant engineer.

This company specializes in automobile castings and has a daily melt of 150 tons. When the tractor transmission housings were first made the interior was formed by one large dry-sand core, made in halves and pasted together. Mr. Stoney improved on this idea some time ago by omitting the dry top core and substituting a green sand top which was *blocked* on thus making a core half green and half dry. From this

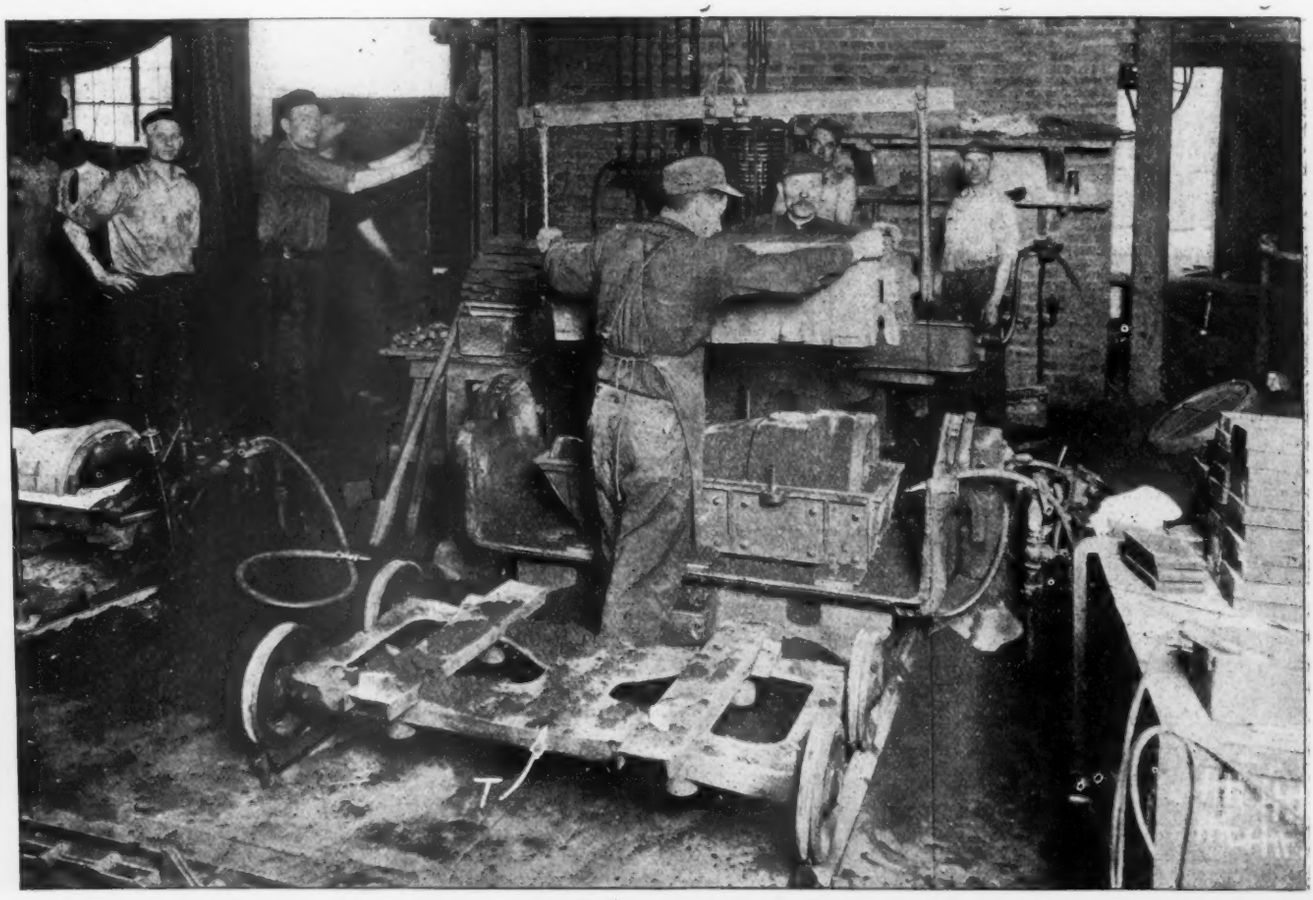


FIG. 1—LOWERING DRAG ONTO COPE COREBOX CONTAINING COMPLETED CORE

point it was a natural gradation to the query, "Why not make the complete core in green sand?" The idea seemed feasible and details of a plan for not only making a green-sand core but also of a continuous molding and pouring system were worked out. This system was built and installed in the Ferro foundry and is now in successful operation. As originally outlined the plan proposed to deliver 200 molds a day, or 400 by working a day and night shift. A comparison of the old and new way will show what an enormous saving in floor space and the number of flasks necessary was effected by the change. The flask measures 3 feet 6 inches by 2 feet, which means that it requires 7 square feet of floor space. Placing the flasks 10 in a row for pouring means 70 square feet in each row. Allowing for 20 double rows and nineteen 3-foot gangways, the total floor space required for the production of 400 molds would be 4020 square feet. In estimating the floor space account must also be taken of the room required to make and dry 400 large cores.

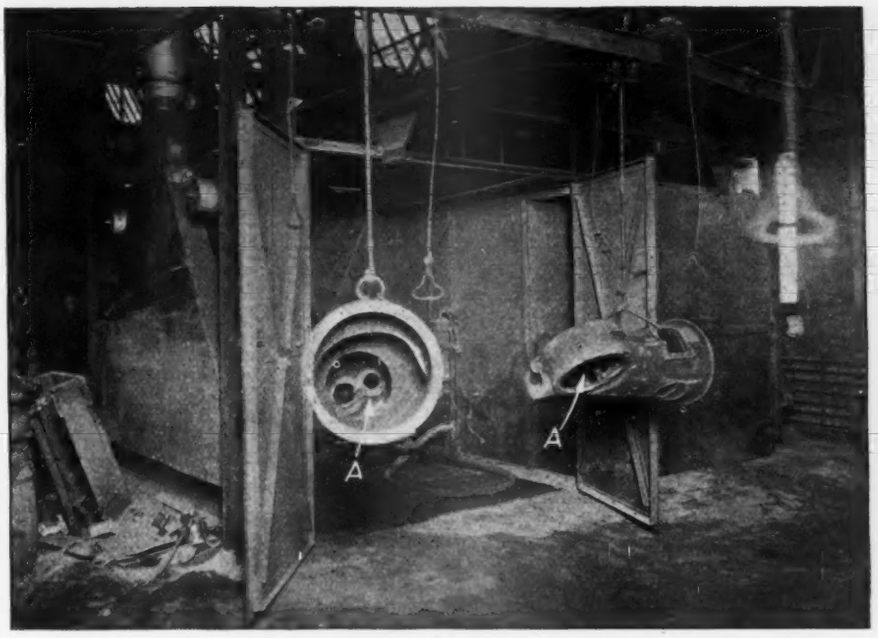


FIG. 2—AT *A* IS SHOWN THE DIAPHRAGM WHICH MADE IT NECESSARY TO PROVIDE A COLLAPSIBLE ARBOR

Under the new system the total area required is a space of 90 feet by 35 feet, or 3150 square feet, while the number of flasks required has been reduced to 50. The installation consists of two units of four machines each; a moving platform, level with the floor, extending from the molding floor to the shaking out pit, and a bucket conveyor for carrying the sand back to a central hopper from which it is distributed to the molding machines by a side dump car. A track is also provided on both sides of the floor for carrying the empty flasks from the shaking-out station back to the molding machines. The trucks are mounted on ball bearings and run so easily that one man can push a load of several flasks. Jib cranes carrying air hoists are situated at convenient points for handling the

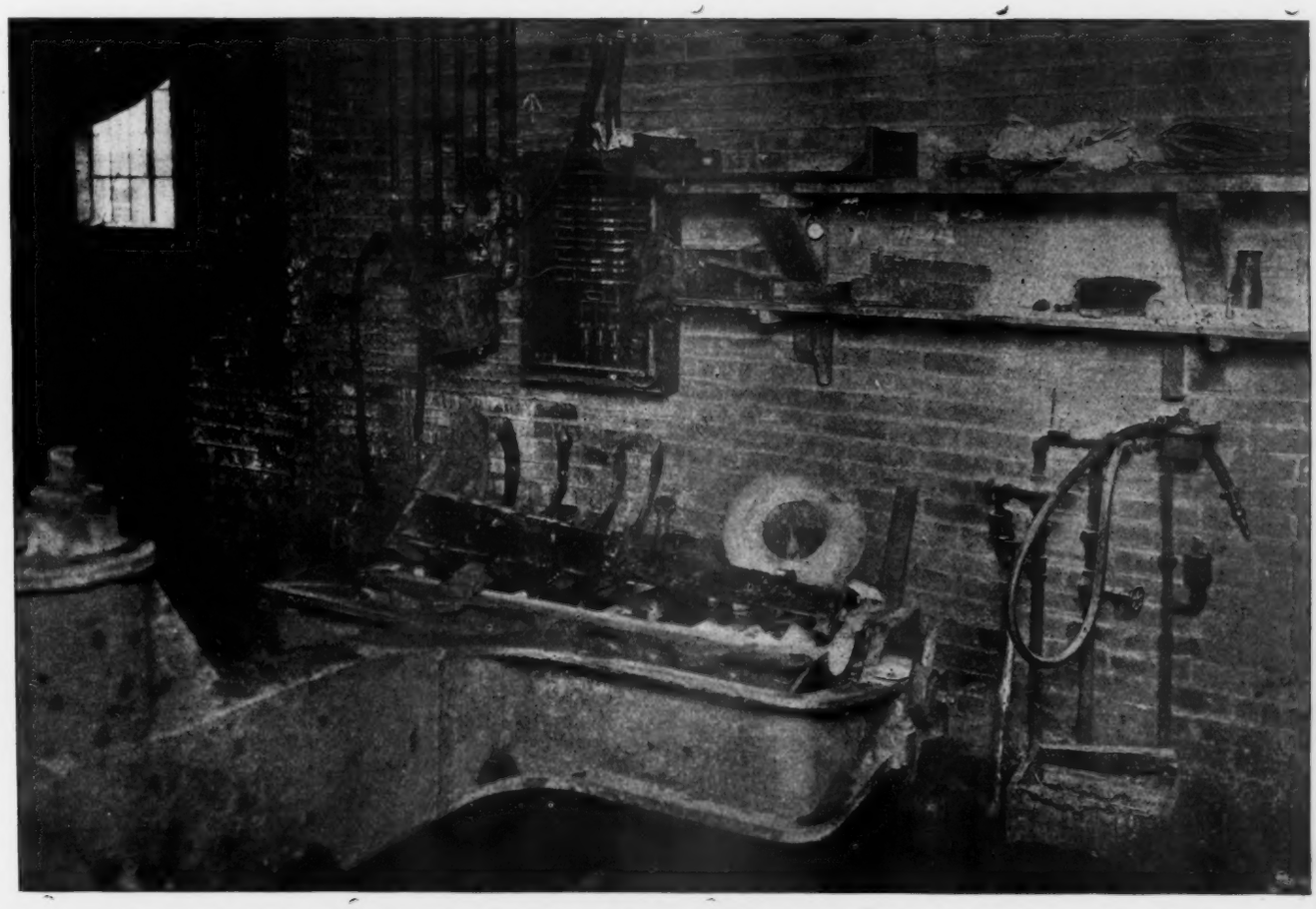


FIG. 3—THE ARBOR ASSEMBLED—ALSO THE ROUND PLATE WHICH FITS INTO THE PRINT IN THE BOTTOM OF THE COREBOX

FIG. 4—STRIPPING-PLATE MACHINE FOR MAKING COPES—NOTE THE CLAMP *R* TO PREVENT FLASK FROM ROLLING OVER

flasks. Each unit is also provided with an electric hoist which runs on a monorail. A Whiting cupola lined to 72 inches has been installed to provide metal for this installation. As each casting weighs 200 pounds, allowing for gates and scrap, the daily melt for 400 molds will be 50 tons. The iron is tapped into a large receiving ladle. This ladle is used for filling smaller ladles which are then hauled over to the pouring floor. An electric hoist running on a monorail serves to pick up the ladle which holds enough to pour three castings.

The flasks used on this job are all interchangeable with the exception of course that the bars in the cope and drag are right and left hand respectively. The joints of both copes and drags are planed and the bottom of the drag is also trued up on the planer so that it will sit snugly on the bottom plate. The sides and ends of the flasks and also the bars are provided liberally with vent holes. The bottom plates are perforated freely with ¾-inch holes. The plates are quite light in section but are reinforced strongly with an exterior flange and several ribs running longitudinally and laterally.

As may be seen at *A*, Fig. 2, there is a diaphragm dividing the casting into two chambers connected by two small openings. There are also two large circular openings near one end. On account of these features the core arbor had to be made of the collapsible type, so that it may be removed after the casting is poured. One of the arbors is shown in Fig. 3. The main part of the arbor is cast solid. The ends and wings are slipped on before the arbor is placed in the corebox. The backbone of the arbor is tapered from one end to the other. Each wing has an opening corresponding in size to the position it is to occupy on the assembled arbor.

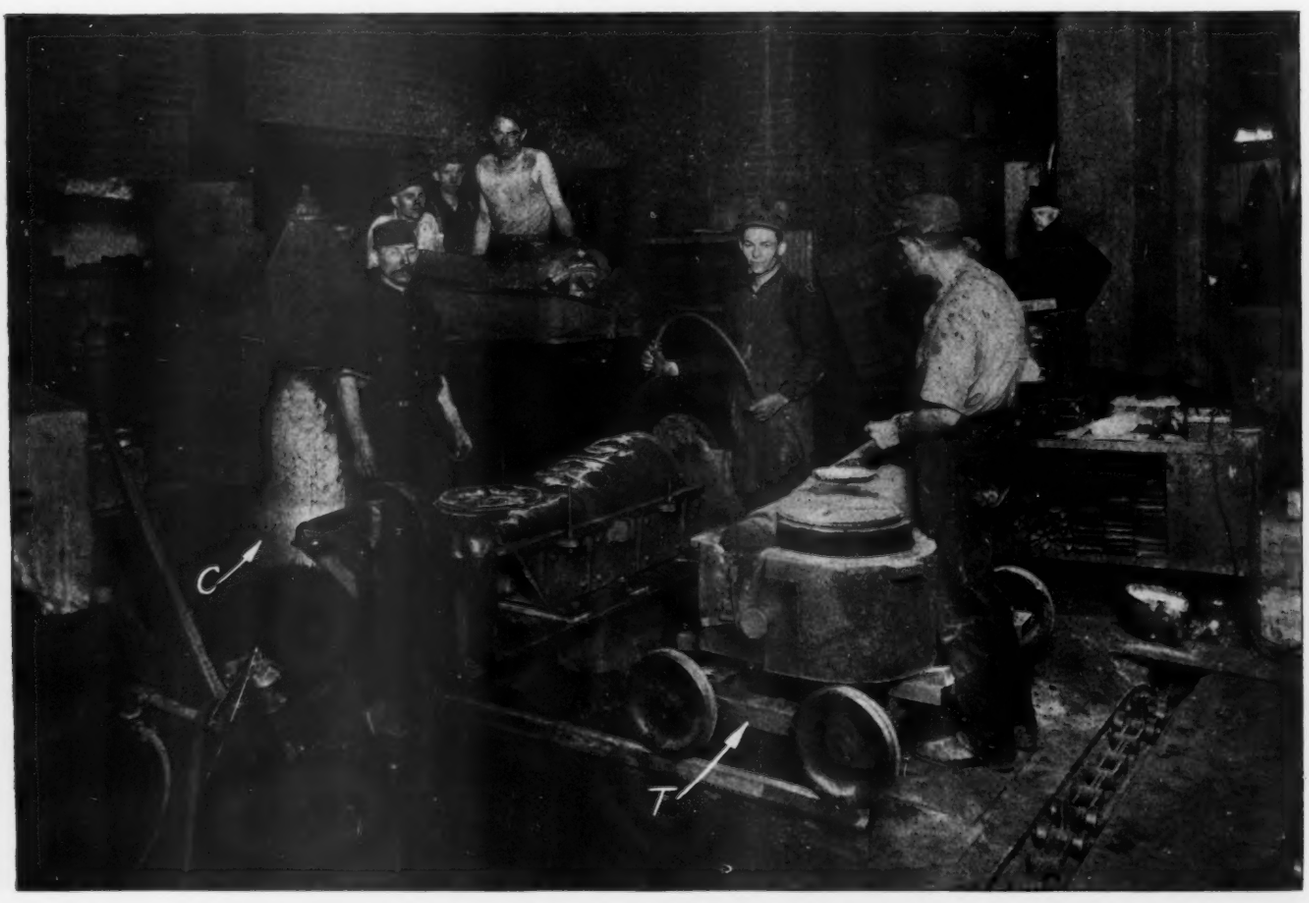


FIG. 5—MACHINE FOR MAKING COPE CORE IN LEFT BACKGROUND—IT ROTATES AROUND THE CYLINDER *C*—NOTE COUNTERWEIGHTS TO BALANCE THE LOAD

By this arrangement it is impossible to misplace the wings and it is only necessary to tap them with a hammer to tighten them up. The round plate, Fig. 3, is detachable and serves to carry the sand in the round end of the core. The arbor contains two ¾-inch threaded holes in the lower side which come in contact with the bottom of the corebox. Bolts are inserted in these holes through corresponding holes in the corebox and are for the purpose of anchoring the core securely while the box and core are being rolled over.

Two sets of four machines are provided for the actual molding of the molds and cores. Each set forms a complete unit. One unit is situated on each side of the central conveyor. The machines are all of the jar-ram type and were built by the Cleveland-Osborn Mfg. Co., Cleveland, with the exception, however, of the machine for making the cope half of the core. This machine possesses several unique features and was constructed by the Ferro Foundry & Machine Co. in its own shops.

The machines for making the copes and drags are identical in operation. One of them is shown quite clearly in Fig. 4. When the flask has been rammed the stripping plate is raised, carrying the flask with it. Then the flask is lifted off the machine and lowered into its respective position, depending whether it is a cope or drag. The machine for making the drag half of the core is shown in Fig. 3. It is provided with mechanism for rolling the box over and subsequently drawing the box off the core. The machine for making the cope core is shown in the left background, Fig. 5. It is the most compurposely for the installation under some special features incorporated purposely for the installation under discussion. It is a jar-ram machine but in addition to the roll-over and pattern-drawing devices possessed by the drag core machine this machine can be rotated through an arc of 180 degrees horizontally. In the accompanying illustration it is shown raised and 90 degrees from normal position.

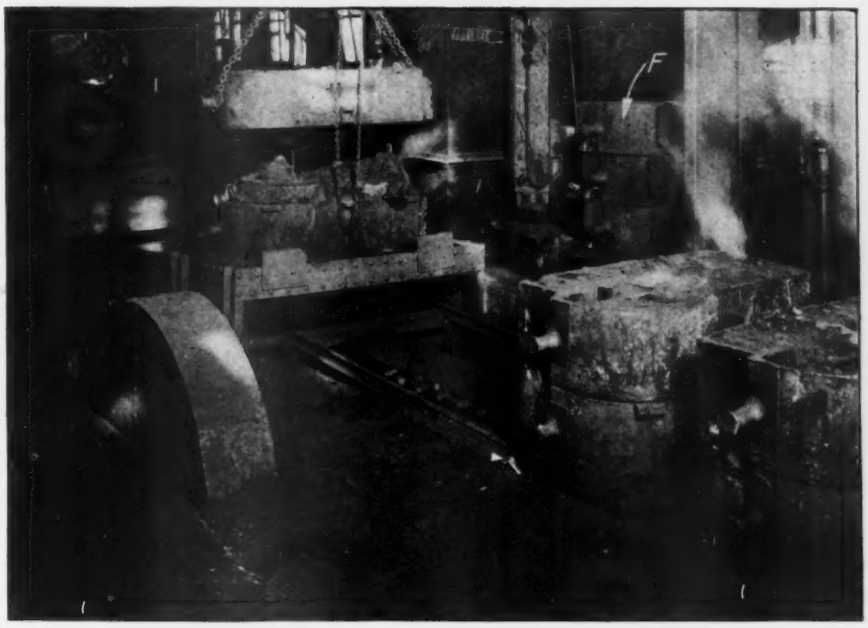


FIG. 7—WHERE THE CASTINGS ARE REMOVED AND THE SAND SHAKEN OUT OF THE FLASKS—AT *F* IS SHOWN A LOAD OF EMPTY FLASKS LOADED ON A TRUCK ON THEIR WAY BACK TO THE MOLDING FLOOR

A crew of nine men is employed on each unit, two men on each machine, with one man to finish the molds and close them. Another man is employed in assembling the arbors and clay washing them for both gangs.

In ordinary molding practice the drag is made first and set down, then the dray half of the mold is set whole core is lowered into place; this is followed by the cope after which the completed mold is clamped and poured. The sequence of operations under the new regime at the Ferro foundry is radically different. The cope half of the core is made first, the drag half is placed on top of it, then the drag half of the mold is set on in the position it leaves the molding machine. The drag and completed core are then rolled over all together and then the cope is set on.

Taking the entire operation of making a mold in order and in detail, the sequence of operations is as follows: The cope core is made first. One man sets in the loose pieces, also the cores for making the diaphragm and brackets plainly shown in Fig. 6. The other man riddles a thickness of sand into the box and both of them set a number of short rods in the prominent corners to reinforce the sand. Then they fill the box with sand from the heap and one man

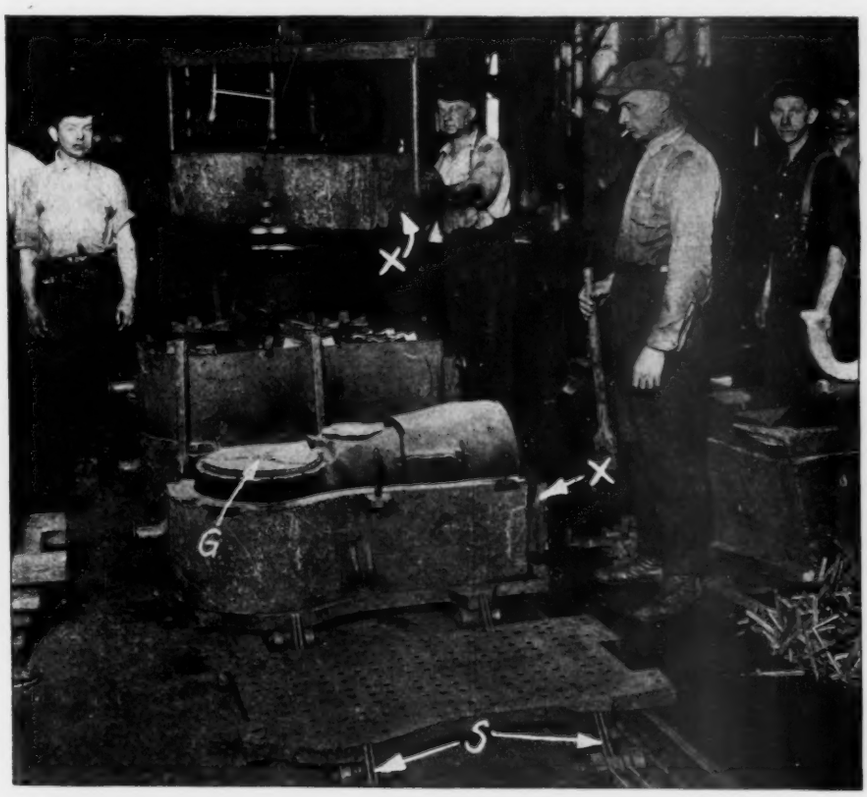


FIG. 6—READY FOR CLOSING DOWN THE COPE—NOTE THE SUBSTANTIAL CONSTRUCTION OF BOTTOM PLATE

opens the air valve and jolts the box four times. This part of the core must be left comparatively soft to prevent the iron from *kicking* off it. The sand is butted lightly by hand after which the surplus sand is struck off. The face is gone over with a vent wire after which all the loose pieces are drawn out and any loose particles of sand removed with the air hose.

In the meantime two men have cleaned out the corebox for the drag half of the core. One man sets the loose pieces, also the cores for making the diaphragm and brackets. The flat piece of iron used for striking off the surplus sand is laid over the opening in the diaphragm core to prevent any sand from entering while the green sand core is being rammed. The arbor and lifting plate are then set in and one man riddles on a thickness of sand. The other man sets eight gaggers at strategic points. He also inserts the two screws previously referred to.

FIG. 8—METHOD OF POURING THE CASTINGS—THE LADLE HOLDS SUFFICIENT IRON FOR THREE CASTINGS

The arbor is provided with suitable bearings at each end to fit snugly in the ends of the corebox and later in corresponding bearings in the ends of the flask. In this way an iron to iron contact is assured which precludes the possibility of the core shifting or cutting through. The box is then half filled with sand, the air valve opened and the core jolted from six to eight times. The sand is then finger tucked under the projecting lugs after which the box is heaped up with sand and butted off. The surplus sand is scraped off. The surplus sand is scraped pieces of pattern removed. The box is then rolled over after which the bracket rotates and carries the drag core around until it is over the cope core. The drag core is lowered into position, a sprinkle of flour being dusted on first to assure a close contact. The box is rapped, drawn off, and swung back into its former position by the bracket of the machine.

While the cores are in process of making, two men are preparing the drag and cope of the mold on molding machines similar to the one shown in Fig. 4. They are of the ordinary stripping plate type and present no unusual features. The drag machine is located nearest the core machines. When the drag is ready it is picked up by the crane, swung around and lowered into place on the machine which holds the completed core. In other words, the drag is closed down over the core instead of, as in usual practice, lowering the core into the drag. It is secured to the table of the machine by four clamps. The table of the machine is then raised, the load rolled over and the truck shown in Fig. 1 is run in underneath. The table of the machine, which is now in an inverted position, is lowered until the drag touches the floor of the truck; travel is then stopped until wedges have been driven under the cleats of the box in order to hold the mold level while the corebox is being withdrawn. The clamps are released and the table of the machine again raised, carrying the corebox with it. The truck is then pulled out to the end of the short track. The finisher sprays the core with water and repairs any irregularities.

A bottom plate is set on the conveyor so that one edge comes in contact with the stops *S*, Fig. 6. The drag containing the core is set on this plate and as the conveyor carries it past the cope machine a cope is lowered on. The flask is then clamped and the open ends made up to prevent runouts. A false end is attached to the end of the flask for this purpose and is clearly shown at *X* and *X*, Fig. 6. When the mold is closed the space between the end of the flask and the false end is packed full of sand.

The mold is poured through one runner connected to three branches in the round end of the cope core. A strainer core is placed at the bottom of the runner and is shown at *G*, Fig. 6.

The end of the conveyor where the castings are removed and the sand shaken out is shown in Fig. 7. From here the castings are taken to the cleaning room, the sand falls through a grating into a pit from which it is taken back to the molding floors and the empty flasks are loaded on trucks and returned to the molding machines thus completing the cycle of operations.

B. F. Sturtevant Co. Buys a New Foundry

On account of increased business, the B. F. Sturtevant Co. of Hyde Park, Mass., has purchased the Framingham foundries of Framingham, Mass. A new concern has been organized to operate these foundries under the name Framingham Foundries, Inc. The new officers are: Noble Foss, president; W. Emerson Barrett, vice president; G. L. Briddy, treasurer, and John J. McElroy, chief engineer. The old foundry in connection with the Hyde Park plant has been discontinued and the building is being remodeled for the manufacture of fuel economizers. The work of this old foundry will be entirely assumed by the Framingham foundry, which latter is being altered to provide for aluminum and brass castings and other special work required in the plant at Hyde Park. The castings are transported from Framingham to Hyde Park in motor trucks.

Forms Sales Company

The Electrolytic Oxy-Hydrogen Laboratories, Inc., New York, has formed a sales and manufacturing company under the name of the Electrolabs Co. The general offices and works of both companies have been moved from Dayton, O., to 2635 Penn avenue, Pittsburgh. The general sales offices are continued at 15 William street, New York City, and branch sales offices have been opened in the Morris building, Philadelphia, and the Merchants Exchange building, San Francisco. I. H. Levin continues in charge of the technical work.

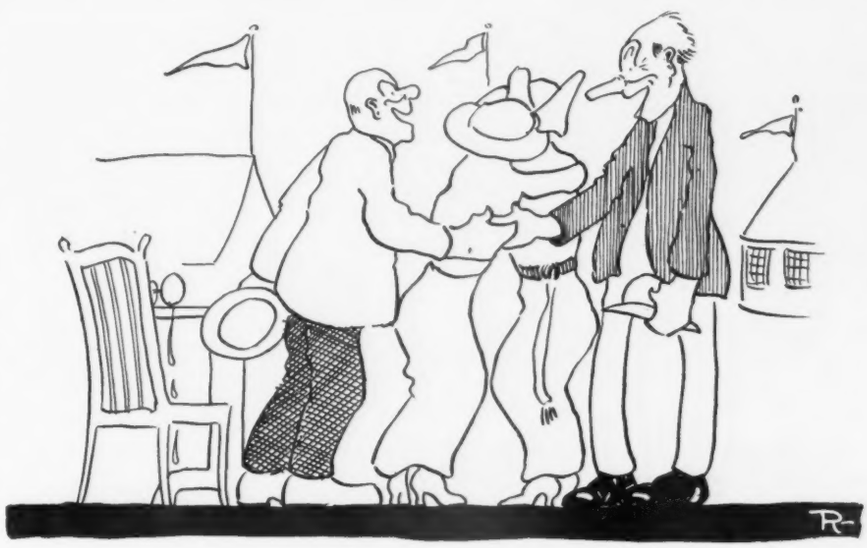
Bill Discusses Clothes and Solid Copes

BY PAT DWYER

LAST Sunday afternoon I was sitting on the back steps enjoying a quiet draft of the weed. It was one of those hot days which make you think that perhaps there is something after all in the theory of future punishment. I was clothed very simply, having neither top shirt, coat, vest, shoes nor hat and wishing that some enterprising returned missionary would introduce the South Sea island custom of appearing in a handkerchief and a safety pin. I would be an easy convert. The lady who is related to me through marriage, joined me later, on the veranda and in order to be sociable and create a topic for light conversation I alluded to this yearning of mine to adopt the costume affected by that dear old ancestor, Adam. She settled that argument by inquiring coldly why I stopped at Adam. Why, she inquired, did I not go back to my true ancestors who wore no clothes at all and hung by their tails from the boughs of trees. Of course I might have retaliated by quoting Langdon Smith's "Evolution" and proved that her ancestors were probably swinging in the same trees at the same time but I knew that she would not admit it and if I went in and got the book to prove it to her she probably would say, "that Smith person was only a man and a lot he knows about it."

I do not pretend to know everything but as a result of several years close and intimate study of this charming lady I know when a subject interests her and when it does not. This no-clothes theory of mine evidently did not interest her, so I proposed that we take a car down to the beach. She was suspicious at first and intimated that my only object in going down there was to see the bathers and start the argument of "clothes or no clothes" over again. I assured her that I would not mention clothes again that day and added by way of a post script that if I was not afraid of getting arrested I would not even wear them. That last remark nearly sidetracked the trip but at last we got away. After reaching the beach we wandered around arm in arm like old friends and eventually landed at an ice cream counter. While sitting there we saw Bill and his wife come strolling along. They stopped when they reached our counter and we had a couple more rounds of the deadly stuff. Then Bill proposed that we shoot the chutes, the ladies would not listen; roller skating, same result; dancing nothing doing. My wife said she was tired and Bill's wife said, "You two men go away for an hour, we will sit here and talk."

"Suits me," said Bill. "Come on."



THEY STOPPED FOR SOME OF THE DEADLY STUFF

As we strolled along I said to Bill: "Doesn't it make you mad when you plan or propose something which requires the help or co-operation of a second party and when the time comes the party of the second part falls down on his or her share of it?"

"No," said he, "I just take things as they come and make the best of them. If the original plan is carried right out, well and good; if a hitch occurs I try to change the plan and adapt it to existing conditions. I'll tell you about a cope I helped a fellow to make one time and you will see what I mean. This cope was about 6 feet long by 4 feet wide and 30 inches deep. I'll tell you what it was for and you will understand better what it looked like. It was for the hood for a water-cooled valve of an open-hearth furnace. The profile of this hood resembled a capital D and the job was molded with the straight side of the D down."

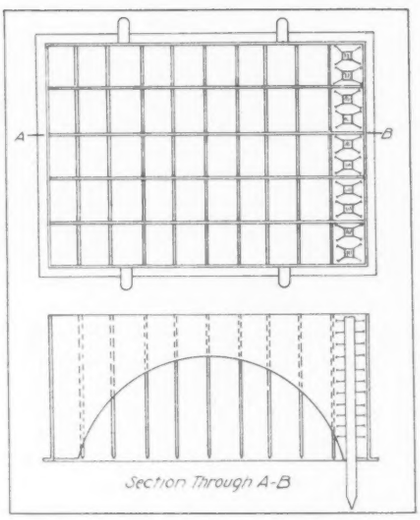
"What's the idea of handing me all these details?" I said, "what do I care what the cope was made for, go ahead and get it made; if you don't hurry up you will have to leave the pattern in the sand over night, the wood will swell and you will never get it out."

"Don't rush the hearse," said he, "the mourners are all on foot, the preliminary details are the most important thing about a job. In fact if the preliminary details had been attended to in this job I am going to tell you about, I wouldn't need to tell you about it because nothing would

have happened. When the effects of the cursed stuff you have been swilling all the afternoon have worn off and you are in a position to think clearly, I know you will be able to call to mind cases where a bearing set for a core while ramming up the pattern or a few gaggers set at strategic points before ramming the cope often saved a lot of laborious patching later. Here I'll make you a sketch of the thing and then the explanation will be easy."

After I reached home I made the sketch shown, from memory. I submitted it to Bill last night for his approval.

"You would never get any medals as an artist," said he, "but you have the idea alright."



THIS IS A SKETCH OF THE THING

Now to return to the beach and Bill's description of the cope.

"This here hood I was telling you about," said he, "on and off for several years was made in the floor with a wooden cope. Most of the castings were all right but every once in a while one would run out, and since all the casting was in the cope, a run out was serious. Some one always tried to stop it by throwing sand and water and pieces of pig iron into the mess. The result in each case was the same, the casting was a waster and the side of the cope was a total loss. "The very last straw, you know the one that broke the camel's back, was put on one night when, after an especially hard day's work, the young man who was making the job at last got it closed. This particular young man had great faith; he believed that if he rammed the sand hard enough he could dispense with gaggers. The pattern came up with the cope so of course he got a lift. He set the cope on a pair of horses in order to finish it over head. When he drew the pattern large patches of sand fell off the joint here and there and, as I remarked a minute ago, he had quite an arduous afternoon. A couple of other lads were sent to give him a hand and they finally got the mold closed. He put on his weights and packed sand all around the joint. It looked all right and he began to pour it, the packing around the joint held until the mold was about half full and then the metal burst out everywhere.

MAGGIE'S SUSPICIONS MIGHT HAVE BEEN WELL FOUNDED

"It was a total loss. In fact you might say she went down with all hands. The molder lost the casting and also lost his job; the foreman lost his temper and unless he has repented for some of the language he used on that occasion I am afraid he lost his immortal soul. The only man who was pleased with the turn of events was the furnaceman, he got the flask or what was left of it for kindling wood.

"The result of this series of accidents, occurrences, setbacks and visitations of Providence was that the foreman decided he would have an iron flask made. With that end in view, striking while the iron was hot you know, and all that kind of thing, he interested the boss patternmaker next day and had a pattern made.

"The foundry foreman had learned his trade in Scotland and was a strong believer in solid iron flasks, that is flasks cast all in one piece. There is no denying the fact that such a type of flask is more rigid than one that is held together with bolts, but it is certainly more difficulty to mold. I was assistant foreman at the time and we had many an argument over the relative merits of built up and solid flasks. He was the chief, so of course I always lost; every iron flask that was made in his time was cast in one piece.

"It was decided to also make a drag while we were at it and a word or two about it may not be out of place. Instead of making a bottom plate the drag had a series of transverse strips cast across the bottom side. These strips were each 2 inches wide by 1 inch thick and were spaced 3 inches apart. This is a style of flask much favored by our British cousins and there is no doubt it has its advantages.

"This particular drag was leveled on the floor and half filled with coke, then filled with sand, rammed and struck off flush with the joint. The pattern for the hood was then set. The pattern was really only a frame, it consisted of two semicircular side pieces ¾-inch thick held in position by two end pieces and a stop-off brace in the middle which extended the whole height of the pattern. This arrangement, of course made it an ideal shape to bed-in. After the flask was set on the drag it was filled with sand and rammed to the top, a parting made with a straight edge and covered with newspapers. The cope I am telling you about was then set on."

"If you were as long making the cope," I said, "as you have been telling about it, I'll say to all the world that it must have cost something."

"Well, there was some trouble experienced in making it," said he. "The man who got the pattern and started the job had the best intentions in the world but unfortunately he neglected to mix a little reason and practical knowledge with his intentions.

"Doesn't St. Paul mention somewhere in his memoirs that faith without works is dead? Well, it was so in this case; the molder had contented himself with driving a single ¾-inch rod in each pocket. You will notice by the sketch that some of these pockets were 30 inches deep so you can imagine what happened when he drew the pattern. Some of the cores remained standing 'tis true but they were pretty shaky and the others had collapsed.

"The molder drew my attention to

the wreck and acting on the principle that the advantage all lies with the man who strikes the first blow, he expressed himself freely and frankly to the effect that the thing was a freak and could not be made. I agreed with the first part of his criticism without, however, telling him so, for discipline is discipline. I contented myself with telling him to dig it out and start over again for it must be made.

"While he was ramming up the outside I had the carpenter make a lot of 2 x 2-inch sharpened stakes of various lengths to suit the different pockets. He drove a row of 3-inch nails down the four corners of these stakes and before starting to ram the pockets two of these prepared stakes were driven in each. They were then rammed in the usual way and believe me when the pattern was drawn next time there was no trouble. The cores stood up as solid as the Rock of Cashel if you know where that is."

"Allright," I said, "I'll take your word for it; let's knock off and call it a day; it is about time we were reporting back to headquarters."

"Headquarters is right," said he. "Let's go; I don't want your wife to think I have dragged you to Dinty's."

How and Why in Brass Founding

By Charles Vickers

Acid-Resisting Bronze Mixture

We would appreciate any information you might be able to furnish regarding a formula for acid resisting-bronze.

An alloy much used as an acid-resisting bronze follows: Copper, 80 per cent; tin, 10 per cent and lead, 10 per cent. What has been termed *standard acid metal* consists of copper, 75 per cent; lead, 15 per cent; tin, 9.90 per cent and phosphorus, 0.10 per cent.

Either of these mixtures is suitable for acid-resisting castings, but it is more important to produce metal free from dissolved oxides, than to select the formula, because what might be considered an inferior formula perfectly deoxidized and so skilfully cast that all defects including intercrystalline shrinkage are conspicuous by their absence, would prove great superior to any recognized *acid metal* that contained oxides, or defective spots resulting from unskilled melting and molding.

Selecting an Acid-Resisting Alloy

We are anxious to get a formula for a good, acid-resisting bronze and will appreciate suggestions with reference to a selection of one of the following alloys: No. 1—Copper, 85 per cent; phosphor bronze, 10 per cent; tin, 2 per cent and aluminum, 1 per cent. No. 2—Copper, 80 per cent; lead, 2 per cent; tin, 5 per cent; zinc, 2 per cent; phosphor bronze, 10 per cent, and aluminum, 1 per cent. No 3—Copper, 90 per cent, and tin, 10 per cent.

Alloy No. 3 is a good acid metal. The constituent given as phosphor bronze we do not understand; if phosphor copper were intended, the phosphorus would be too high for any purpose, while if it is phosphor tin, then the content is too high. The addition of aluminum would ruin both alloys. We suggest that both Nos. 1 and 2 be erased from your book of mixtures, on the principle of safety first.

In making No. 3 alloy for resisting acids it is important that it be free from all oxides, and that a fine-grained fracture be obtained. This can be done by carefully melting the copper, using no less than 1 inch of fine charcoal on top, and one teaspoonful of salt to 100 pounds of metal. Just before adding the tin, charge 0.5 per cent of 30 per cent manganese copper, "A" grade. Stir thoroughly, add the tin, get the metal hot and pour immediately.

Mixtures for Commutator Castings

Please furnish us with a formula for making castings for commutator parts. Our customer wants castings to look like copper and machine like brass.

To meet these requirements it will be necessary to incorporate lead with the copper, which will spoil the metal so far as electrical conductivity is concerned. The following alloys will afford a selection for a suitable formula: Copper, 94 per cent; zinc, 3 per cent, and lead, 3 per cent.

Copper, 95 per cent; 5 per cent phosphor tin, 2 per cent, and lead, 3 per cent.

Copper, 95 per cent; silicon copper, 1 per cent, and antimony 4 per cent.

The latter mixture will produce a rather hard, red alloy of little mechanical strength, but which will machine easily. The two alloys first given are stronger, melt the copper and then add the deoxidizer, whether zinc, phosphor tin, or silicon copper; then follow with the but also softer. In making the alloys, lead or the antimony. The result will be a metal that is no better for electrical purposes than brass, but will probably be satisfactory to the purchaser because it will machine easily.

Aluminum Die Casting

We have orders for aluminum die-castings and would like to know the best formula to use for the same.

About the best formula to use for an aluminum alloy for die casting purposes is as follows: Aluminum, 92 per cent; copper, 8 per cent. Melt a portion of the aluminum until cherry red, then dissolve in it the copper in the form of thin sheet and add balance of aluminum. Another way of making this alloy is to melt any amount of copper, say 25 pounds, and add gradually the same weight, in this case 25 pounds, of aluminum, thus making an alloy consisting of 50 per cent each of copper and aluminum. If 16 pounds of this alloy are melted with 84 pounds of pure aluminum the result is that 8 per cent of copper has been added.

This alloy is known as No. 12 aluminum. It has a melting range of 540 to 637 degrees Cent. and a shrinkage of 0.156 inch per foot, according to Circular No. 76 of the Bureau of Standards.

Brass for Patterns

We would like to obtain the formula for an alloy suitable for brass patterns; also a good yellow brass mixture and a mixture for white metal.

The following alloy makes a good pattern metal: Copper, 90 per cent; tin, 5.50 per cent; zinc, 3 per cent, and lead, 1.50 per cent. A good casting yellow brass can be made according to the following formula: Copper, 72 per cent; zinc, 24 per cent; tin, 2 per cent, and lead, 2 per cent.

A white metal that is excellent for patterns and for other purposes is made up of lead, 80 per cent; tin, 10 per cent, and antimony, 10 per cent. Melt the lead and heat until red hot, add the antimony and allow it to dissolve, remove from the fire and add the tin.

New Duplexing Process is Invented

High-Carbon Steel is Melted in the Electric Furnace and Transferred to the Converter to be Finished—A Good Grade of Metal is Obtained at Low Cost

BY H. E. DILLER

FEW, if any, inventors conceive an idea which is not later improved upon by others who build on the original conception and are guided by experience. Also it is seldom that the originator of a new departure in any branch of the arts or sciences appreciates the extent to which his invention will be developed or the breadth of its scope. When the electric steel furnace was first advocated for the manufacture of steel it was recommended for use in the production of higher grade steels in competition with the crucible furnace. After electric furnaces were in operation a while, improvements were gradually made in their design and methods of manipulation. The tilting arrangements and the mechanisms for holding the electrodes were improved, apparatus for automatically controlling the electrodes during the heat was installed, a better grade of carbon electrodes was made and graphite electrodes were introduced.

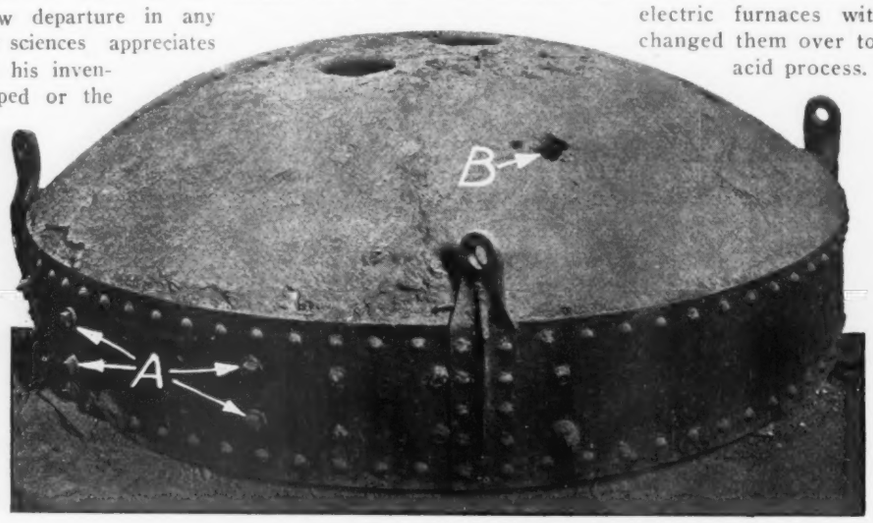


FIG. 1—ROOF OF FURNACE MADE WITH GANISTER

With improved furnaces came diversified applications. Steel made from the open-hearth furnace was refined in the electric furnace, and the electric process came to be used extensively for making alloy steels and in steel foundries. At first a basic lining was almost universally used. Later a furnace was designed to operate with an acid bottom. Then some of the foundries which were running their electric furnaces with a basic bottom changed them over to make steel by the acid process. One foundry which operates three electric furnaces with acid bottoms because stock low in sulphur and in phosphorus is at present easily procured has arranged to put a basic bottom in one of the furnaces when it becomes difficult to obtain stock suitable for acid melting. This furnace will then be used to refine the steel by taking out some of the sulphur and phosphorus. The refined steel will be transferred to the acid-lined furnace where it will be made ready for pouring.

Until recently, in every case, whether the electric furnace has entirely re-

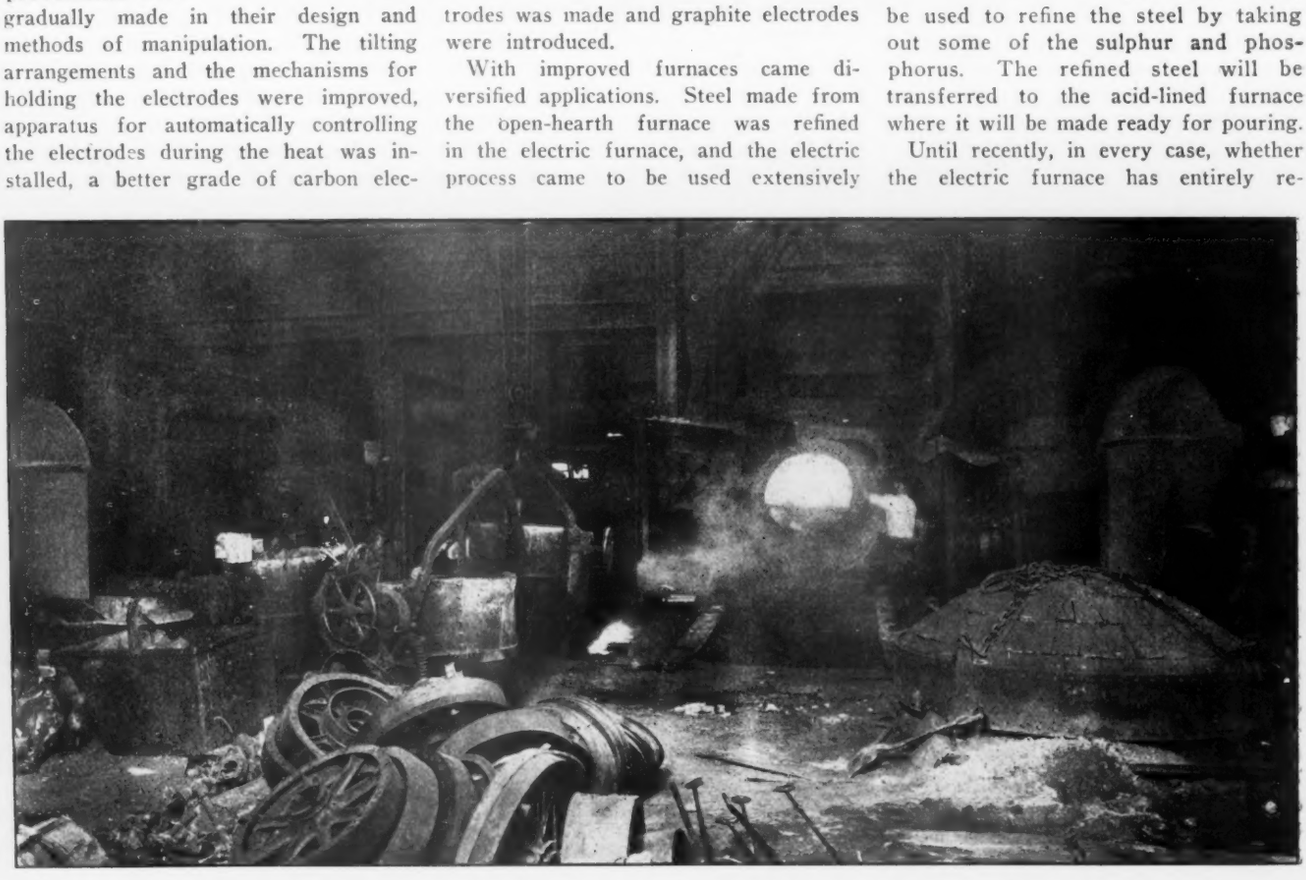


FIG. 2—POURING MELTED RECARBURIZING METAL INTO THE CONVERTER AFTER THE STEEL HAS BEEN BLOWN

FIG. 3—AFTER THE ROOF HAS BEEN SWUNG BACK THE FURNACE IS CHARGED WITH DUMP BUCKETS

placed another furnace or has been used only to refine steel made by another process, the steel has been finished in the electric furnace. This fact makes doubly interesting the new departure of the West Steel Casting Co., Cleveland, in which steel is melted in an acid-lined electric furnace and then transferred to a converter and finished by blowing.

The West Steel Casting Co. was established in 1906 and at first made steel castings by the converter process. A 36-inch and a 72-inch cupola and three 2-ton side-blow converters were installed originally. These can be seen in Fig. 2. The converters made steel

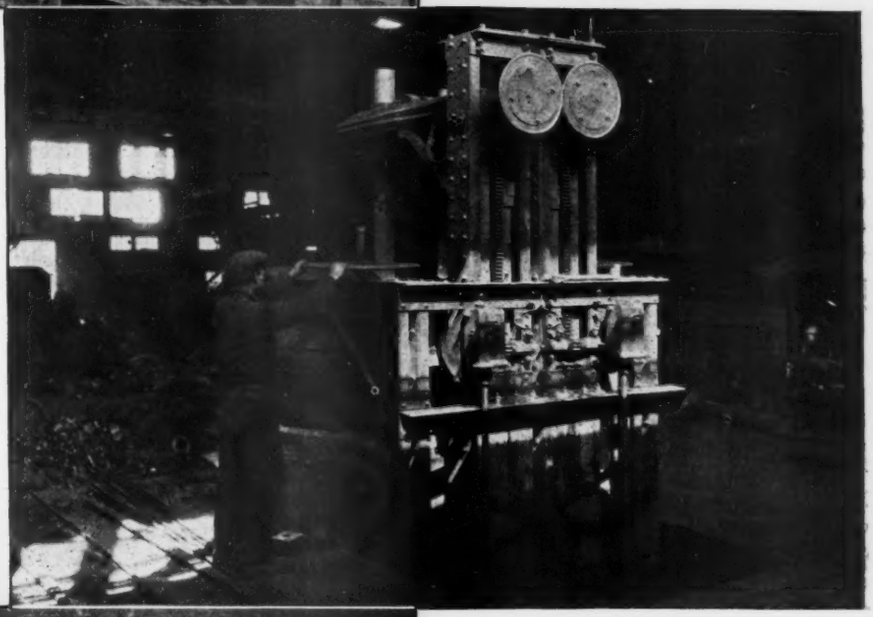


FIG. 5—THE REAR OF THE ROOF IS RAISED SLIGHTLY BY TURNING TWO WHEELS—THE MAN HOLDS ONE, THE OTHER IS ON THE OPPOSITE SIDE

FIG. 4—TAPPING THE HEAT—THE MAN ON THE LEFT IS OPERATING THE SWITCH WHICH CONTROLS THE TILTING OF THE FURNACE

which was satisfactory, until it became difficult to procure low-sulphur coke and pig iron. This greatly increased the sulphur content of the finished steel due to absorption of sulphur in the cupola during melting, and some castings from this high-sulphur steel were found to crack. For this reason and because the price of low-phosphorus pig iron needed in the converter process was unusually high in proportion to scrap which could be used in an electric furnace, the West company decided to install some kind of an electric furnace.

Accordingly, a 3-ton Snyder furnace manufactured by the Industrial Electric Furnace Co., Chicago, was purchased and provided with an acid lining. This furnace is operated by a General Electric automatic control system. A tilting top allows the charge to be put into the furnace with a dump bucket as illustrated in Fig. 3. It was found that in tilting back, the rear end of the cover rubbed on top of the rear wall of the furnace. To overcome this the West company designed a mechanism to lift the rear of the cover slightly before tilting it. This is accomplished by means of two hand wheels as shown in Fig. 5. Before the cover is tilted each of the two wheels are given a few turns. The back of the roof is raised only a slight amount in this way, but it is enough to prevent it from striking the wall of the furnace when swinging back.

The roofs of these furnaces are generally made of silica brick which it is rather expensive to renew. In or-

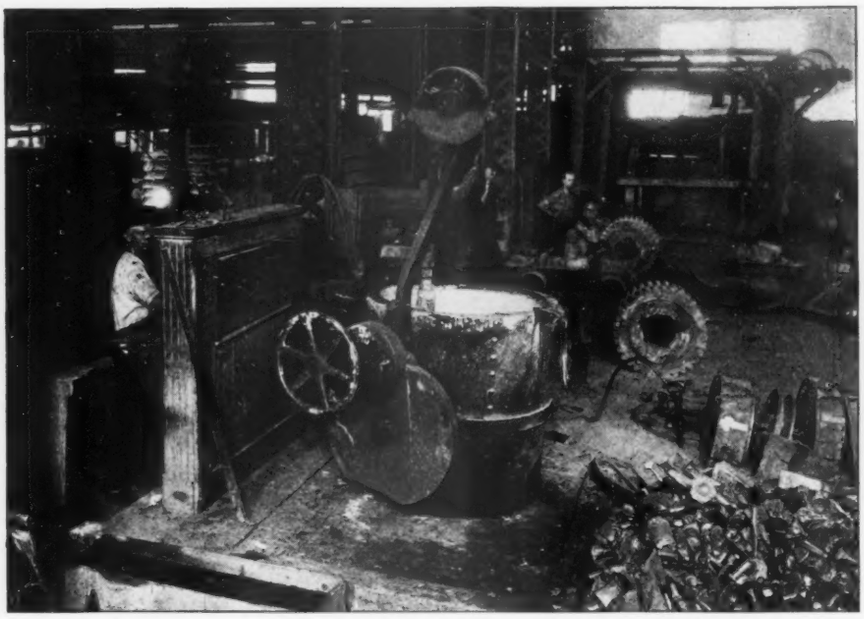


FIG. 6—THE LADLE IS WEIGHED WHEN IT IS EMPTY AND AGAIN WHEN FILLED WITH METAL FROM THE FURNACE AND FROM THE CONVERTER

der to lessen this expense the West company is now experimenting with a ganister roof which gives indications of being an improvement over the brick roof. One of these roofs is shown in Fig. 1. Several sets of steel bars are run from one side of the outside rim to the other. The ends of some of these bars can be seen at *A* in the illustration. With these bars acting as an arbor, the wet ganister in the condition of a thick mud is built up to form the roof. Holes are left for the electrodes and four other holes, one of which is shown at *B*, Fig. 1, are molded in the roof to facilitate drying. The roof is allowed to air dry for a short while and the drying is then finished in an oven.

The first experimental heat was taken off in January, 1918, and production of steel castings from the electric furnace began in February of the same year. The company at the start had some difficulty in operating the furnace so as to get a uniform grade of steel at all times but gradually became more familiar with the manipulation of the furnace and the metallurgical requirements and obtained better results.

Suggestion from Converter Practice

The fact that occasionally when a converter heat finished too cold to pour into the molds it was placed back into the vessel and blown, after carbon had been added to it, opened up the line of reasoning which suggested that the electric furnace steel should be transferred to the converter and finished by blowing. Experiments in this direction proved the feasibility of the plan which was further developed and patents on the process were applied for. The process as it is at present operated is as follows: A charge of approximately 2600 pounds of metal is melted down in the electric furnace with as little oxidation as possible. The make-up of the charge varies with market conditions. Frequently steel turnings are used to a large extent but recently the charge has been made up of 550 pounds of pig iron, 2300 pounds of foundry sprues and scrap, and 1700 pounds of forging scrap together with 30 pounds of 70 per cent ferromanganese and 40 pounds of 50 per cent ferrosilicon. Melting in the electric furnace takes only a small percentage of carbon out of the metal and the carbon in the pig iron brings the carbon in the melted charge up to about 0.60 per cent. The sulphur and phosphorus in the melted metal will run around 0.050 per cent or less while the silicon will be close to 0.65 per cent and the manganese will range from 0.40 to 0.60 per cent.

As soon as the charge is melted and has reached the proper temperature for blowing it is poured into a ladle which had previously been weighed. The ladle is then put on platform scales, Fig. 6, and again weighed, after which it is poured into the converter and blown. The blowing requires approximately 10 minutes, while on the average an 18-minute blow is required to convert cupola metal.

Recarburizers Added

After the blow recarburizers are added to the metal in the converter in the form of 12 per cent ferrosilicon, 70 per cent ferromanganese and 18 per cent spiegel. These are melted in a double-chambered, oil-burning furnace of 500 pounds capacity, manufactured by the Monarch Engineering & Mfg. Co., Baltimore. The recarburizing metal is transferred from the melting furnace to the converter in two bull ladles. Fig. 7 illustrates the furnace and Fig. 2 shows the recarburizer being poured into the converter. This recarburizer also acts as a deoxidizer but another deoxidizer is added in the ladle in the form of ferrotitanium. Before taking the metal to the molding floor for pouring the ladle is again placed on the scales and weighed.

As this procedure is so different from any of the other methods of making steel in an electric furnace or in a converter, it would be well to consider

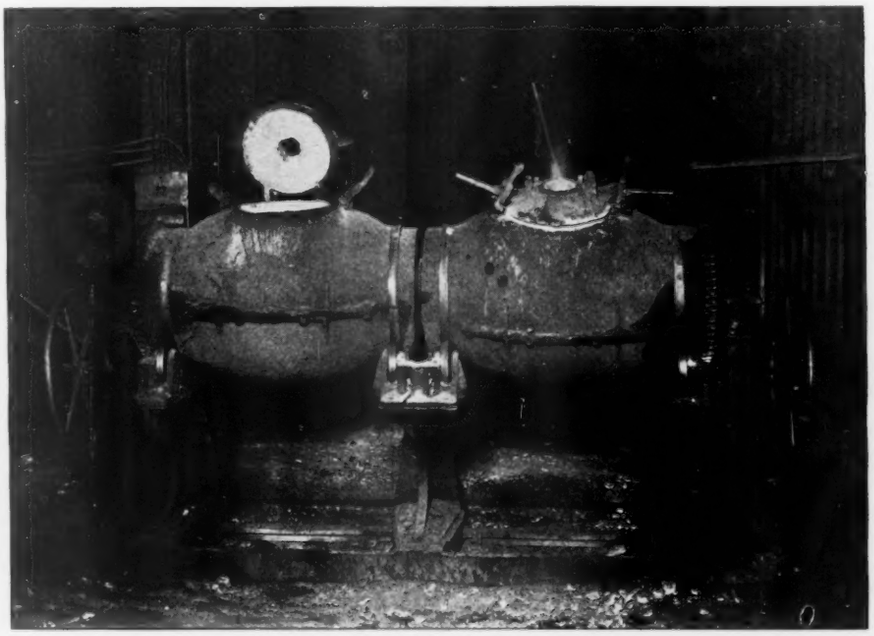


FIG. 7—RECARBURIZING METAL IS MELTED IN OIL-FIRED FURNACES BEFORE BEING ADDED TO THE CHARGE IN THE CONVERTER

he advantages claimed for the method used by the West Steel Casting Co. To compare it with the straight converter process it is first seen that sulphur is not added to the metal when melting it down in the electric furnace like it is when melting in a cupola in contact with coke. Again, a cheaper charge can be used by taking advantage of the comparatively low cost of forging scrap and steel turnings over the present high cost of low-phosphorus pig iron. Under the present somewhat unusual conditions this lower cost of the charge more than offsets the higher melting cost of the duplex method. The loss of metal in the converter is only 6 per cent as compared to a loss of 20 per cent when metal is melted in the cupola and then blown in the converter. This is due to the fact that the steel from the electric furnace has considerably less silicon and carbon to be burned out and the blow consequently is continued only about half the length of time required for cupola metal. To the loss in the converter must be added a loss of 1.5 per cent in the electric furnace when the duplex process is used. This makes a total loss of 7.5 per cent by the duplex process against a loss of 20 per cent by the converter process, or a loss of 1.5 per cent as found by the West company in the straight electric furnace process.

The main advantage which the West company found in the new method over straight electric furnace melting is one of cost. The expense of transferring the metal from the electric furnace to the converter and blowing it is more than made up for by the fact that the time required for a heat in the electric furnace by the duplex process is approximately one hour less than if the heat were finished in the electric furnace. In the duplex process the charge is in the electric furnace 1.5 hours on the average while for the straight electric furnace process 2.5 hours are required. This saving of time is effected by melting down a higher carbon charge in which the melting point is considerably lower than the melting point of steel with 0.25 to 0.30 per cent carbon such as is used for castings. Time is also saved due to the fact that it is not necessary to bring the steel in the electric furnace to a definite composition and then deoxidize, when following the duplex process. The advantages of the new process are not so apparent when a high carbon steel is to be made and for this reason high carbon heats and for this reason high carbon heats are finished in the electric furnace instead of being transferred to the converter.

FIG. 9—VIEW OF THE ANNEALING FURNACES—NOTE SOME OF THE CASTINGS MADE BY THE COMPANY

When the electric furnace was installed a small laboratory was fitted out for determining the carbon in the finished steel and for preliminary tests during the melt. This proved so valuable that it was decided to equip a complete laboratory for the analysis of raw materials and the determination of all the elements in finished steel. A view of the balance room is shown in Fig. 8. In this room combustion determinations of carbon are also made.

One of the first studies made in the laboratory covered the effect of the different processes on the oxidation of the steel. It was found that the finished steel made by the straight electric furnace process contains on the average 0.02 per cent oxygen while steel made entirely in the converter contains 0.04 per cent oxygen and steel made by the duplex process is midway between the two, containing approximately 0.03 per cent oxygen.

The duplex process as carried on by the West Steel Casting Co. gives them a metal which has proved satisfactory. The company makes a variety of carbon and alloy steel castings. Some of the castings can be seen in Fig. 9, which shows a view of the annealing furnaces. On the left are gears and pinions and on the right are auto-truck axle housings. The company does an extensive business in truck castings and for some time has been making a cast-steel truck wheel.

FIG. 8—BALANCE ROOM OF THE LABORATORY IN WHICH ACCURATE WEIGHING OF MINUTE SAMPLES IS CARRIED ON

THE FOUNDRY

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All Ready for Foundrymen's Week

FOUNDRYMEN'S week takes on a new significance this year because of the new problems which are confronting the industry in all parts of the world. A year ago when the foundry convention was held in Milwaukee every industrial resource in the country was bent to the prosecution of the war. The final victorious attack of the allies was in full swing. By the time the twenty-fourth annual convention of the American Foundrymen's association assembles in Philadelphia during the week of Sept. 29, nearly a year will have elapsed since fighting ceased. But the industrial world, of which the foundry business is an important factor, has by no means resumed a normal peace time status. In fact, the months which have elapsed since the signing of the armistice have served merely to demonstrate that the processes of readjustment are only beginning. With several great nations delaying the ratification of the peace treaty, industry is still living in the penumbra of war.

Unusual significance, therefore, is attached to the forthcoming convention at Philadelphia. It is doubtful if another meeting will be held under similar conditions for many generations. The problems of both a technical and business nature which await discussion are as numerous as they are urgent. The prospects therefore, for an unusually large attendance at the Philadelphia meeting are gratifying. Every foundryman in the country owes it to himself and to his business to attend this great annual gathering.

The technical papers prepared for the American Foundrymen's association and the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers cover a wide range of subjects of unusual interest to foundrymen. Eleven distinct topics are treated in papers scheduled for presentation at the three sessions devoted to general topics. Not including the annual banquet, the American Foundrymen's association will hold seven sessions, while three will be held by the Institute of Metals division. Over 70 papers, reports and addresses will be presented during convention week. Sessions specially devoted to gray-iron foundry, malleable foundry and steel foundry problems will be held. It is expected that an unusual amount of interest will be attracted by the session devoted to industrial relations which will be held Thursday morning.

There is no doubt the exhibition of foundry and shop equipment, which will be held at the Philadelphia Commercial Museum, will far surpass anything of the sort ever attempted previously in the United States. The 60,000 square feet of floor space available in this hall has proved inadequate for the requirements of the manufacturers desiring to display equipment. More than 80 exhibitors who were not represented at Milwaukee last year will show equipment at Philadelphia. This year's show will be marked by an unusually large number of working exhibits, especially those consisting of machine tools and molding machines. British-made machine tools will be displayed for the first time in the United States; also many American manufacturers will exhibit tools which have never been shown before. This feature of the foundry convention alone is worth a trip across the continent to any progressive foundryman.

Trade Outlook in the Foundry Industry

GRAY-IRON casting shops in practically all sections of the country seem to be approaching the saturation point where the business at hand is more than sufficient to employ all the workmen they are able to command. The betterment which has been noted from week to week since the first of June continues and practically all plants are busy to full labor capacity. The automobile shops which made the most rapid "get-away" in the race for prosperity have continued in the lead. In consequence all foundries handling this class of work and particularly those in the vicinity of Detroit, Cleveland and Chicago are booked far in excess of their capacity, and automobile manufacturers are looking to remote sources for their castings. The influence of this preponderance of one class of work has been felt by other lines. Manufacturers of hardware specialties, patented appliances, and heaters who job their castings and assemble their product are having difficulty in placing their work as automobile orders which came on the market earlier with a steadily increased volume of business at attractive prices have crowded out the more reluctant lines which have started a buying movement within the last month. In the East it is reported that the demand for ornamental and structural castings is increasing. Jobbing foundries have more miscellaneous machinery work than they can handle and plumbing and fitting shops are at full capacity. Prices on gray-iron castings in the East continue in the neighborhood of from 5 to 7 cents per pound for rough medium weight work. The textile industries are exceedingly active and have created a demand for light and medium castings used in looms and fabricating machinery and in the various centrifugal extractors and dye-works machinery.

Prices Of Raw Materials for Foundry Use

CORRECTED TO SEPT. 12

Iron		Scrap	
No. 2 Foundry, Valley	$26.75	Heavy melting steel, Valley	$20.00 to 20.50
No. 2 Southern, Birmingham	27.50	Heavy melting steel, Pittsburgh	20.50 to 21.00
No. 2 Foundry, Chicago	26.75	Heavy melting steel, Chicago	19.00 to 19.50
No. 2 Foundry, Philadelphia	28.50 to 29.50	Stove plate, Chicago	23.50 to 24.00
Basic, Valley	25.75	No. 1 cast, Chicago	26.50 to 27.00
Malleable, Chicago	27.25	No. 1 cast, Philadelphia	24.50 to 25.00
Malleable, Buffalo	27.25 to 29.00	No. 1 cast, Birmingham	24.00 to 25.00
Coke		Car wheels, Iron, Pittsburgh	25.00 to 25.50
Connellsville foundry coke	6.00 to 6.50	Car wheels, Iron, Chicago	23.50 to 24.00
Wise county foundry coke	7.00 to 7.50	Railroad malleable, Chicago	20.50 to 21.00
		Agricultural malleable, Chicago	20.50 to 21.00

Steel Works Buying

Both iron and steel foundries in the Pittsburgh district are operating at between 60 and 70 per cent. The principal demand at present is for the special castings peculiar to blast-furnace and steel-mill practice. Rolling-mill equipment, pumps and valves for blast furnaces and special fittings are being produced in quantity to make replacements which were delayed during the war emergency. Shops making these classes of castings have orders booked which will keep them busy for the next six months. Railroad buying still is confined to replacements so far as rolling stock is concerned, but the recent inquiries for machine tools for shops and the general pressure of public opinion demanding that railway equipment be brought up to efficiency are regarded as hopeful signs for early car business. Prices in the vicinity of Pittsburgh still continue to favor the buyer slightly, particularly in jobbing-shop work. Stove foundries throughout Pennsylvania and Ohio are busy to the limit of labor and plant capacity, and many of this class, under which may be included furnace and radiator shops, have extensive additions planned or under way to care for the volume of orders at hand. It is stated that the depleted stocks of contractors coupled with the enormous increase in dwelling construction has brought about an unprecedented demand for all classes of heating equipment.

Implements Pick Up

The unexplained state of coma which prevailed for a time in farm implement and allied lines seems to have passed. The price agitation which seemed likely to develop a backfire through its effect on agricultural commodities has not influenced the demand for agricultural castings as it was feared it might. Foundry business in general through the Mississippi valley is improved. In the Chicago district, foundries are operating at between 65 and 70 per cent of capacity which is in many cases an increase of 20 per cent over two months ago. The steady development would seem to preclude any chance of a slump. Labor conditions are better in the Central West, and sufficient men are available to meet all needs. Prices of castings range in the neighborhood of 6 to 7 cents a pound, with a few notable exceptions. One case in point illustrates the premium carried by high-speed production. A certain manufacturer neeeded about four tons of castings weighing about ½ pound each, but he needed them in less than a week. The castings with no machining except two drilled holes and a slight amount of grinding were contracted at over 20 cents a pound.

Iron Buying Continues

Buying of pig iron in small lots still continues though most larger foundries are covered and many have specified full shipment of last half orders. Inquiries for first half 1920 are not meeting with encouragement from producers, though some small lots are said to have been sold at prevailing prices. A reduction in scrap prices is noted. Foundries are buying cast scrap freely and consequently the decline in this grade is less marked. Demand for this sort of scrap is heavy in proportion to the supply. Nonferrous foundries, particularly those dealing in plumbing brasses and fittings are extremely busy. The price level remains fairly constant. New York quotations follow: Casting copper, 21.62c to 22c; lead, 6c; tin, 56c; antimony, 8.50c; aluminum, No. 12 alloy, 28c to 30c. The comparison of average prices for nonferrous metals for July and August follow:

	Tin	Lead	Zinc	Antimony	Aluminum
	New York, spot	New York	St. Louis	Spot	No. 12
July	.....	5.645	7.587	8.85	27.363
August	60.761	6.00	7.55	8.952	28.333

Comings and Goings of Foundrymen

WALTER A. JANSSEN, who has been operating manager of plants for the Canadian Steel Foundries, Ltd., with headquarters at Montreal, has resigned and has been appointed assistant general manager in charge of operations of the American Steel Foundries, New York, Chicago and Pittsburgh, with headquarters at Chicago. In August, 1917, Mr. Janssen resigned as foundry superintendent, after a 10-year service with the Bettendorf Co., Bettendorf, Iowa. Shortly after, he was appointed operating manager of the plants of the Canadian Steel Foundries, Ltd., located at Longue Pointe and Pointe St. Charles, Que., and the steel foundry and rolling mill at Welland, Ont. In 1917 Mr. Janssen was a director of the American Foundrymen's association and chairman of its committee on steel foundry standards. Last year at the Milwaukee meeting of that organization he was elected vice president.

John P. Fahy has accepted a position as foundry superintendent with the Coe Mfg. Co., Painesville, O.

J. A. Moore has resigned his position as foundry superintendent of the American Blower Co., Detroit, Mich.

George Taylor Clift has been made superintendent of the Nazareth Foundry & Machine Co., Nazareth, Pa.

I. H. Carbaugh has been appointed general foundry superintendent for the United Roll & Foundry Co., Ravenna, O.

A. L. Fay, manager of the Chicago office of the Werner G. Smith Co., Cleveland, has severed his connection with that company.

Louis Rasmussen formerly with the Northern Foundry Co., Marinette, Wis., has accepted a position as foundry superintendent for the Nash Motors Co., Racine, Wis.

Frank T. Taylor has become traffic manager and purchasing agent of the Fort Pitt Steel Casting Co., McKeesport, Pa., to succeed Thomas S. Disler, who resigned recently.

O. J. Rice who until recently was in government service on the Panama canal has accepted a position as foundry foreman with the Aurora Foundry Co., Seattle, Wash.

Fred Gebhauer has been appointed special navy yard representative for the Chicago Pneumatic Tool Co., and will be located in the offices of the company at Philadelphia.

William Titherington has resigned as foundry foreman for the F. R. Patch Mfg. Co., Rutland, Vt., to accept a similar position with the Bilton Machine Tool Co., Bridgeport, Conn.

Scott Mackay recently with the British Forgings, Ltd., Toronto, and previously with Jones & Laughlin Steel Co., Pittsburgh, has been made general superintendent for the Stowell Co., South Milwaukee, Wis.

Byron F. Stowell, for many years associated with the Hendee Mfg. Co., Springfield, Mass., as master mechanic and engineer is now mechanical engineer for the Napier Saw Works, Inc., located in the same city.

L. E. Paynter, formerly foundry superintendent for the Sowers Mfg. Co., Buffalo, has accepted a similar position with the Connersville Foundry Corp., successors to the Hoosier Castings Co., Connersville, Ind.

Urban W. Frink, for the past three years manager of the Boston office of the E. J. Woodison Co., Detroit, has left the employ of the company to open an office for the sale of foundry supplies and equipment in Boston.

J. G. Brezinski recently was appointed general foundry superintendent for the Star Mfg. Co., New Lexington, O., manufacturer of mine and contractors cars, semisteel car wheels, mine equipment and forges. Mr. Brezinski formerly was with the Kanawha Mfg. Co., Charleston, W. Va.

Charles A. Lynch, of Philadelphia, has become connected with the sales department of the Fort Pitt Steel Casting Co., McKeesport, Pa. He formerly was affiliated with the Pittsburgh district ordnance office as chief operator, carriage division, in charge of inspection and manufacture of gun carriage components.

John Q. Reid, who has been superintendent of the Longue Pointe works of the Canadian Steel Foundries, has been promoted to the position of general superintendent of the company. Before going with the Canadian Steel Foundries, he was works manager of the Chester, Pa., plant of the American Steel Foundries.

Thomas S. Disler, formerly traffic manager and purchasing agent of the Fort Pitt Steel Casting Co., McKeesport, Pa., recently resigned that position to become assistant secretary in charge of traffic and sales of the Kendall Lumber Co., Oliver building, Pittsburgh. Frank T. Taylor succeeds Mr. Disler at the Fort Pitt Steel Casting Co.

Charles G. Spicer has been transferred from the Fergus, Ont. plant of the Beatty Bros., Ltd., to the branch of that company located at London, Ont., Canada. Mr. Spicer who at one time was in the metal pattern department of the International Harvester Co., Hamilton, Ont., will have charge of both wood and metal pattern work in the London plant.

W. C. Epstein, until recently in charge of the production engineering division of the bureau of aircraft production at New York and previous to that time with the American Brake Shoe & Foundry Co., Chicago, has been made general superintendent of the Duff Manufacturing Co., Pittsburgh. E. M. Webb has been made production superintendent and John Kopf, manager of the engineering department of the same company.

E. W. Morgan, who for 31 years was foreman of the brass foundry department of the Turner & Seymour Mfg. Co., Torrington, Conn., has resigned to become superintendent of the brass foundry to be established in Bridegport, Conn., by H. B. Houghton. Mr. Houghton recently purchased the plant of the Bridgeport Tube Co., at auction. He formerly was connected with the sales force of the Turner & Seymour Mfg. Co.

Sam A. Schaeffer, who several years ago left the Clarage Fan Co., Kalamazoo, Mich., where he was foundry superintendent, to accept a similar position with the Sheffield Car Co., now the Fairbanks-Morse Mfg. Co., Three Rivers, Mich., has returned to the Clarage Fan Co. as assistant to the general superintendent. B. C. Page, formerly with the Northwestern Harvester Co., Spokane, Wash., succeeds Mr. Schaeffer with the Fairbanks-Morse Mfg. Co.

James M. Buick, vice president and general manager of the American Car & Foundry Co., recently was made vice president in charge of sales, the office of general manager having been abolished. William C. Dickerman is vice president in charge of operations. Frederick A. Stevenson is assistant vice president in charge of

operations and he also will be head of the manufacturing section, in charge of production in car plants, rolling mills and foundries.

James Erickson, who resigned recently as superintendent of the pattern department of the Western Malleables Co., Beaver Dam, Wis., now is principal owner of the Erickson-Young Pattern & Mfg. Co., Beaver, Dam, organized to manufacture wood and metal patterns for the general foundry trade and to conduct a machine shop. Harry Young left his position as resident inspector at the western shops in Beaver Dam, of the Standard Steel Car Co., to take charge of the new business.

Harvey P. Barnard recently became works manager of the Midland, Pa., plant of the Pittsburgh Crucible Steel Co. For the past few months, he has been production manager and prior to becoming affiliated with the Pittsburgh Crucible Steel Co., he was superintendent of plant B of the United Alloy Steel Corp., Canton, O. Robert W. McDonald, who has been acting works manager of the plant, has resumed his former position as superintendent of the Crescent works of the Crucible Steel Co. of America, the parent company of the Pittsburgh Crucible Steel Co.

George A. Bartle recently became plant superintendent for the Great Falls Iron Works, Great Falls, Mont. After being graduated from the engineering department of the University of Minnesota, he has held responsible positions with the Flour City Ornamental Iron Co.; the Emerson-Brantingham Co., and the Minneapolis Steel & Machinery Co., all of Minneapolis, leaving the latter position to take up his new duties at Great Falls. Houghton A. Duncan has been made office manager for the Great Falls Iron Works, to succeed E. K. Keuzarder, who resigned to enter business for himself.

Louis E. Strothman, who is a member of the American Society of Mechanical Engineers and the American Society of Chemical Engineers as well, resigned recently as general manager of the steam turbine and pumping engine department of the Allis-Chalmers Mfg. Co., Milwaukee, to become vice president and general manager of the Richardson-Phenix Co., that city, manufacturer of mechanical lubricating apparatus, in which he has acquired an interest. J. William Peterson is president and treasurer. Mr. Strothman became connected with the Allis-Chalmers company in 1902, after being affiliated with the Nordberg Mfg. Co., and the Filer & Stowell Co., Milwaukee.

Obituary

Stephen E. French, past president of the New England Foundrymen's association and one of the two honorary members of that organization, was killed recently in an automobile accident in Boston. Mr. French was born at Orange, Mass., and nearly all of his busiess life was spent with the Athol Machine Co., Athol, Mass. He was treasurer and general manager of that company at the time of his resignation a year ago at which time he became associated with the George F. Blake

STEPHEN E. FRENCH

Mfg. Co., East Cambridge, Mass. Mr. French was one of the best known foundrymen in the New England territory, both through business connections and his activity in the foundrymen's association.

Otto A. Ruemelin, works manager and second vice president of Pawling & Harnischfeger Co., Milwaukee, died Sept. 1. Mr. Ruemelin has been associated with the same company for over 30 years. He entered the plant as an apprentice, served several years as a journeyman and was promoted successively to the foremanship of various departments. His energy, ability and kindly nature made rapid his rise from a foremanship to assistant superintendent, superintendent, and finally works manager, a position which he held continuously from 1912. He enjoyed the marked respect of all with whom he was associated and particularly with the men in the shop of which he was the directing head.

Electrical Heaters for Pattern Plates

There is a tendency for moisture to collect on cold metal patterns. This moisture comes from the damp sand and from the atmosphere on humid days. When a pattern is wet the sand of the mold adheres to it causing small holes on the surface of the mold which then produces a rough casting.

The collection of moisture can be prevented by heating the pattern. The heat applied, however, must not be so great as to cause the sand in the mold to dry, as it would then crumble away and again the casting would have a rough surface. Furthermore, the heat must be applied in such a way that the pattern can be conveniently changed when desired.

The usual method of heating is by means of a gas flame left burning in the space underneath the pattern within the frame work of the molding machine. It is difficult to keep the flame low enough so that it will not heat the pattern too much. A larger flame than necessary is, therefore, employed at some distance from the surface of application. This makes an inefficient arrangement, as most of the heat is dissipated into the surrounding space. Some trouble is also experienced in keeping the flame properly regulated.

In order to obtain a more efficient and convenient method for heating molds the Westinghouse Electric & Mfg. Co. manufacture electric heaters, one style of which is shown in the accompanying illustration. Two steel-clad heaters are shown mounted in the space immediately below the metal pattern plate, within the framework of the molding machine. In order to use as little heat as possible, they are located just below the thickest pattern used. They are attached to simply supporting angles connected to the frame of the machine. It is obvious then, that any pattern of any thickness and of any size within the capacity of the machine, may be attached to or removed from the molding machine without being interfered with by the heaters, and without disturbing the heaters.

An asbestos insulating plate is inserted just below the heater to prevent undue loss of heat.

The heaters consist of slotted ribbon resistors insulated in mica troughs, the whole being enclosed in a heavy sheet steel casing. The two heaters used on each machine have a total rating of 300 watts and operate on 110 volts. Connection is

METAL PATTERNS ARE DRIED BY ELECTRIC HEATERS

made to a wall recepticle convenient to the machine, by means of a flexible cord having a separable attachment plug on the end of it.

If for any reason, such as the machine standing idle, the pattern plate should become overheated, it is only necessary to pull the plug from the receptacle and leave the heater disconnected until the plate cools to the proper temperature.

Develops New Type of Molding Machine

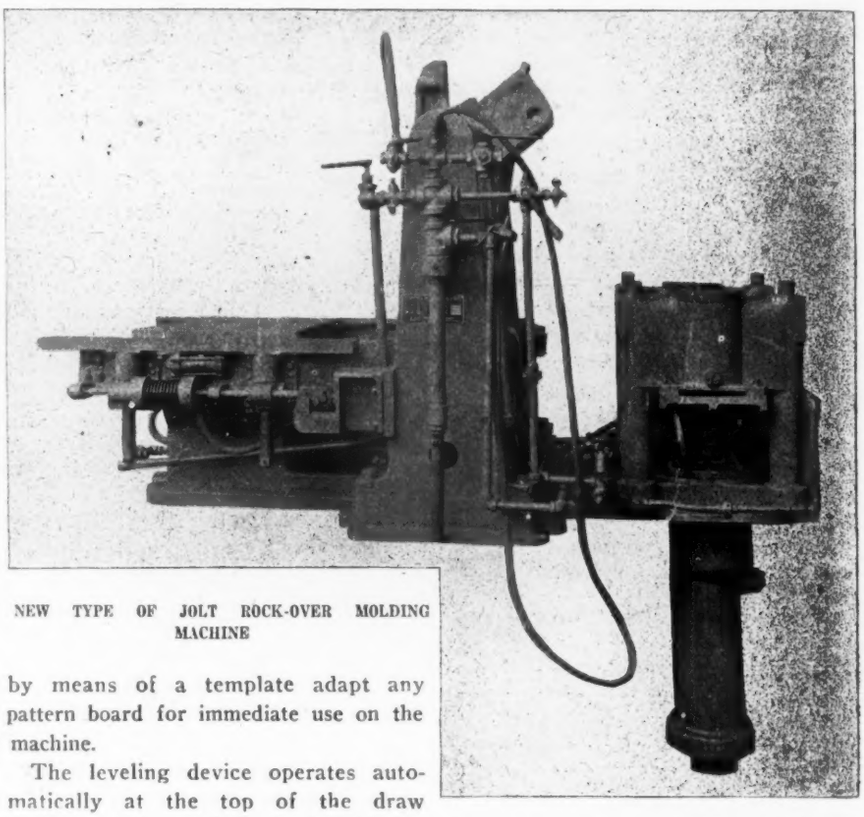
Simplicity of design and ease of operation were two factors sought in designing the jolt rock-over draw machine shown in the accompanying illustration. It is a product of the Dayton Molding Machine Co., Dayton, O. The jolt rammer employed has a full table impact on a landing surface composed of laminated steel sheets and is operated by a simple valve which is enclosed in the base of the machine. This valve consists of a hardened machine-steel plug and it is pointed out that it automatically controls the amount of air used.

The table is supported underneath its entire surface at the point of impact. The jolt table supports the pattern board during the ramming and transmits the blow direct. A single rock-over cylinder is used, the swing being protected by sand-proof shields.

The rock-over arms are cast steel, channel section, and are made rigid to prevent the load from swaying. The standards are of heavy channel section. A variable leverage is obtained for light and heavy flasks through the medium of an adjustment provided on the rock-over crank. An automatic locking mechanism is used to hold the pattern board to the rock-over arms during the rocking over operation.

As soon as the rock-over arms leave the horizontal plane, the pins are drawn through the locking rods which are attached to the pattern bars. These pins are kept in place by means of a coil spring while they are holding the pattern bars to the arms but the actual locking is done by means of rollers which engage a hooked bracket on the machine standards. The load, it is said, cannot be hung on a dead center.

In designing the machine, attention was given to simplifying the rigging. Four holes drilled at convenient points



NEW TYPE OF JOLT ROCK-OVER MOLDING MACHINE

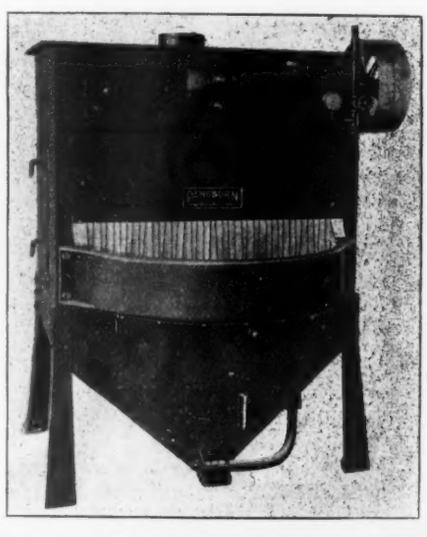
by means of a template adapt any pattern board for immediate use on the machine.

The leveling device operates automatically at the top of the draw plunger stroke and it is locked by air, eliminating the use of a hand lever for this purpose. It is said that the draw head never has to be adjusted for different depths as it is self-adjustable. Two heavy vibrators are incorporated to rap the pattern during the drawing operation. After the pattern is drawn, it may be rocked back to receive the next flask before the finished mold is removed from the machine.

The pattern board rests directly on the jolt rammer table which eliminates a floating plate. This arrangement, it is pointed out, gives the machine a wide range and permits of rapid pattern changes. The type of pressure leveling device employed is said to eliminate all deflection of the arms. In drawing, a smooth start is secured through the medium of an oil-controlled draw plunger followed by a uniformly accelerated draft. To insure perfect alignment, the bed is made exceptionally strong and heavy.

Rotary Table Sand-Blast for Small Shops

The demand for hygienic sand blast equipment that protects the operator resulted in the production of an automatic rotary table type installation. This at first was made only for large type. of equipment led the Pangborn corporation recently to design and build a smaller size shown in the accompanying illustration for use in foundries having a small output. It also may be used as an auxiliary for special work or to take care of periodical peak loads whenever they come.



THE ENTIRE OUTFIT COVERS A FLOOR SPACE OF 4 FEET 8 INCHES BY 4 FEET 3 INCHES

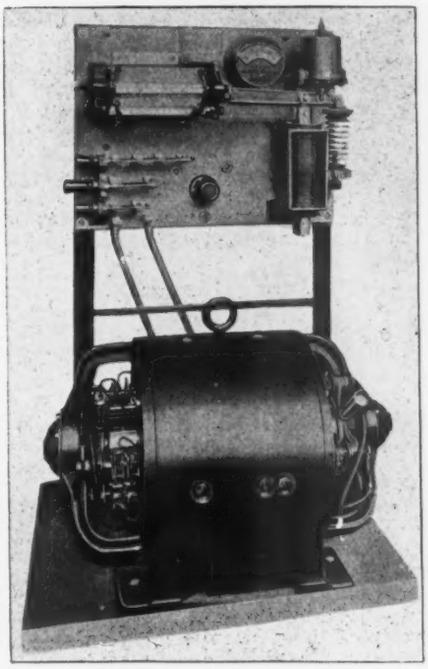
The outfit consists of a rotating table, half exposed and half in a dust-tight housing in which the blasting action takes place. Work to be cleaned is loaded, turned as required, removed and renewed while the machine is in operation. The table top is 42 inches in diameter. The total floor space required is 4 feet 8 inches by 4 feet 3 inches.

The table top is provided with a guard 4 inches in height which prevents the light work from being shaken or blown off when in the machine. The 10-inch opening through which the castings reach the cleaning zone is closed by multiple-section, flexible rubber curtains which retain the flying abrasive and dust.

Suction-type sand-blast action is used. The spent abrasive falls through the table top and returns to the blasting member in a continuous cycle. Provision is made for connection to an exhaust system for removing dust and disintegrated material.

An Electric Welding Unit

A new plastic-arc welding unit has been developed by the Wilson Welder & Metals Co., New York. This set, shown in the accompanying illustration, is composed of a dynamotor and current control panel. The generator is flat-compound wound, and maintains the normal voltage of 35 on either no load or full load. The control panel has been designed to provide a constant-current panel, small in size, of light weight and simple in operation. The panel is of slate 20 x 27 inches and on it are mounted a small carbon pile, a compression spring, and a solenoid working in opposition to the spring. The solenoid is in series with the arc so that any variation in current will cause it to vary the pressure on the carbon pile, thereby keeping the current constant, at the value it is adjusted for.



THREE SWITCHES ON THE PANEL PROVIDE FOR CURRENT ADJUSTMENT

Three switches on the panel provide a means of current adjustment between 25 and 175 amperes. The arrangement of the welding circuit is such that 25 amperes always flows through the solenoid when the main switch is closed. The remainder of the welding current is taken care of in by-pass resistances shunted around the solenoid.

This device is built in the form of a dynamotor unit, and also as a gasoline-driven unit, or it may be belt-driven.

Enrique Touceda will be the speaker at the first of the regular monthly meetings of the Pittsburgh Foundrymen's association which is to be held Monday evening, Sept. 15 at the Chatham hotel, Pittsburgh. Mr. Touceda's topic is "Some Pertinent Facts in Connection with Gray Iron and Malleable Castings."

What the Foundries Are Doing

Activities of the Iron, Steel and Brass Shops

The Bridgeport Pattern & Model Co., Bridgeport, Conn., has filed notice of dissolution.

The main building of the Freeland Foundry Co., Hazleton, Pa., recently was damaged by fire.

An addition, 60 x 90 feet, will be erected at the plant of the N. & S. Foundry Co., Seattle.

Bids are being taken for the erection of a foundry for the Monarch Foundry Co., Detroit.

The plant of the Dusdiker Foundry & Machine Co., Peoria, Ill., recently was damaged by fire.

A foundry building will be erected by the Moline Iron Works, Moline, Ill., according to a report.

Erection of a cupola and mill building is planned by the Thacher Propeller & Foundry Corp., Albany, N. Y.

The Sydney Foundry & Machine Co., Sydney, N. S., is in the market for a site on which to erect a plant addition.

The Gary Foundry & Machine Co., Gary, Ind., recently increased its capital from $15,000 to $100,000.

Erection of a foundry is being planned by C. Tillups Sons Co., Norfolk, Va., manufacturer of blows, etc.

Officers of the Liberty Brass Foundry, 24 Thomas street, Bloomfield, N. J., recently filed notice of organization.

The Hamilton Beach Mfg. Co., Racine, Wis., is reported contemplating the erection of a foundry, 80 x 200 feet.

The Baltimore Car & Foundry Co., Curtis Bay, Baltimore, is reported to have purchased property adjoining its plant.

Bids will be taken shortly for the erection of plant additions by the Trenton Malleable Iron Works, Trenton, N. J.

The Benton Harbor Malleable Foundry Co., Benton Harbor, Mich., is reported planning to build 50 homes for its employes.

The Mackintosh-Hemphill Co., Pittsburgh, is reported to have acquired 25 acres at Aspinwall, Pa., as a site for a new plant.

An increase in its capital stock from $40,000 to $100,000 recently was made by the Portland Forge & Foundry Co., Portland, Ind.

Contracts for the erection of three plant additions recently was awarded by the Wilson Foundry & Machine Co., Pontiac, Mich.

The plant of the Central Foundry Co., Vincennes, Ind., which has been closed for five years, is expected to be reopened shortly.

An increase in capital from $75,000 to $125,000 has been authorized by the stockholders of the Pettigrew Foundry Co., Harvey, Ill.

Burnett & Crampton, Rigaud, Que., are having plans prepared for the erection of a foundry to have a capacity of 250 tons a month.

The bureau of yards and docks, navy department, Washington, is planning the construction of a pattern shop at the Norfolk, Va., navy yard.

Contracts have been awarded by the Pollak Steel Co., 9757 Baltimore avenue, South Chicago, Ill., for the erection of a foundry, 75 x 142 feet.

The plant of the Eagle Foundry Co., University and Twenty-sixth avenues, recently was damaged by fire. The company is reported planning to rebuild.

Erection of an addition, 144 x 232 feet, is contemplated by the Ruhl Malleable Iron Co., Adair street, Detroit. S. A. Cummins is secretary.

Construction of an addition to its foundry and machine shop has been started at the plant of the Lycoming Foundry & Machine Co., Williamsport, Pa.

Contracts for the erection of a gray iron foundry addition for the A. E. Martin Foundry Co., Milwaukee, have been awarded the A. F. Wagner Iron Works.

The J. C. Born Machine & Foundry Co., Belleville, Ill., has increased its capital from $10,000 to $30,000 and has changed its name to the Columbia Mfg. Co.

T. L. Johnson and E. G. James are officers of the James Iron Works, Rock Hill, S. C., which was recently organized. The company plans to establish a foundry.

The Corporation Pattern Works, Rochester, N. Y., recently was organized to manufacture metal pattern specialties, by George J. Fink, William H. Kramer and others.

Plans for the reorganization of the Wheeling Mold & Foundry Co., Wheeling, W. Va., are being com-

pleted, and it is expected the company will be recapitalized.

Capitalized at $200,000, the Rock Island Brake Shoe & Foundry Co., Rock Island, Ill., recently was incorporated by M. I. Morris, Hyman Lewis and Simon Lewis.

An increase in capital from $600,000 to $1,200,000 has been authorized by the stockholders of the Everlasting Valve Co., 49 Fisk street, Jersey City, N. J.

A foundry addition, 100 x 100 feet, is being erected at the plant of the Rathbone Mfg. Co., Grand Rapids, Mich., of which W. G. Renwick is secretary-treasurer.

Immediate erection of a plant at Seneca Falls, N. Y., is reported being planned by the Westcott Valve Co., Erie, Pa. Frank Cavenagh is vice president and treasurer.

Plans have been completed for the construction of two additions, 80 x 100 feet and 80 x 150 feet, at the plant of the Anderson Foundry & Machine Works, Anderson, Ind.

The Illinois Malleable Iron Co., Chicago, is reported to have closed a deal whereby it purchased a 42-acre site at Louisville, Ky., on which it plans to erect a foundry.

Following the erection of initial buildings of its proposed plant, the Canion Airbrake Co., Calvert building, Baltimore, will erect a pattern shop, foundry and machine shop.

A contract has been let by the Ashland Brass Foundry, Ashland, O., for the erection of an office and foundry building, 45 x 70 feet, to be ready for occupancy about Nov. 1.

A recent foundry company to be organized is that of the Ohio Valley Foundry Co., Marietta, O. C. Lanam is one of the organizers. The company will operate a gray iron foundry.

The Buffalo Foundry & Machine Co., 1543 Fillmore avenue, has awarded a contract to B. S. Crocker Co., Builders Exchange, for the erection of a plant addition, 70 x 77 feet.

The Belding Foundry Co., Belding, Mich., which recently increased its capital from $25,000 to $100,000, is having plans prepared for the erection of a plant addition, 60 x 120 feet.

A manufacturing plant to include a foundry, is reported being planned by the Honolulu Iron Co., Honolulu, H. I., to be erected in Manila, for the manufacture of sugar mill machinery.

Mills, Rhines, Bellman & Nothoff, Ohio building, Toledo, O., are preparing plans for the erection of a foundry for the Willys-Morrow Co., Elmira, N. Y., of which J. Edwin Morrow is secretary.

The McKim Foundry & Machine Co., Lockport, N. Y., which recently increased its capital from $50,000 to $100,000, is enlarging its plant by the erection of a foundry, 100 x 200 feet.

The United States Cast Iron Pipe & Foundry Co., Burlington, N. J., has awarded a contract to the Foundation Co. for the erection of an addition, 120 x 344 feet, to its plant at Addyston, O.

A contract has been awarded the Aberthaw Construction Co., 27 School street, Boston, by the Crompton & Knowles Loom Works, Worcester, Mass., for the erection of a pattern storage structure.

A recent incorporation is that of the Cambria Car & Foundry Co., Ferndale, Pa. The company, which was capitalized at $5000, was incorporated by H. J. Widmann, Johnstown, Pa., and others.

Greenlee Bros. & Co., Rockford, Ill., machinists and founders, are expected shortly to start on the erection of a plant addition which will add about 20,000 square feet of floor space to their present quarters.

Plans are being prepared for the erection of a plant to include a foundry and machine shop on Grantley street, York, Pa., for Harry Read. When completed it will be occupied by the Read Machinery Co.

Organization of the Transfer Metal Castings Co., Newark, N. J., has been effected by William Karanatz, 133 Chestnut street, and Joseph Keegan, 85 Somme street. The company will operate a plant on Doremus avenue.

The Bridgeport Castings Co., Bridgeport, Conn., recently was incorporated with $100,000 capital, by Harry B. Houghton, Edward P. Quinn, Torrington, Conn., Thomas R. Good and William H. Monagan, Waterbury, Conn.

A recent New Jersey incorporation is that of the British-American Rotary Valve Co., Jersey City, N. J. The company, which is capitalized at $1,500,000, was incorporated by Edward Eriksen Sr., Edward Eriksen Jr. and Harry Eriksen.

Stoves and similar equipment will be manufactured by the South Beloit Stove & Mfg. Co., South Beloit, Ill., which was recently incorporated with $30,000 capital, by Charles H. and L. G. Burgess and R. B. Williams.

The Madden Iron Works, Sixteenth street and Santa Fe avenue, Los Angeles, founder and machinist, is reported to have acquired a site on which it plans the erection of a new plant. P. and M. Madsen head the company.

Ralph M. Hill, John W. Eshenbrenner and Frank J. Kurras recently were named as the incorporators of the East St. Louis Casting Co., 619 North Seventy-first street, East St. Louis, Ill., which was chartered with $40,000 capital.

Incorporation papers have been filed by the Thormann Bronze & Brass Foundry, Inc., Medford, Mass. The company which is capitalized at $10,000, was incorporated by Charles E. Thormann, William Klingenberger and Albert H. Thormann.

The Eureka Pattern & Mfg. Co., Ltd., Toronto, Ont., has been incorporated to manufacture patterns, castings, etc., by Thomas Bathgate, 115 Marchmont road, David B. Adamson, William Owen and others. The company is capitalized at $40,000.

The Banner Gas Range Works, South Bend, Ind., has increased its capital from $75,000 to $100,000.

A contract for the erection of a plant, 60 x 250 feet, recently was awarded by the H. C. Cook Co., Ansonia, Conn., manufacturer of brass goods.

The Coppus Engineering & Equipment Co., Worcester, Mass., will enlarge its brass foundry by the erection of an addition, 55 x 240 feet. The company is planning to increase its capital from $100,000 to $250,000. It manufactures steam turbines and blowers.

The Warman Brass & Aluminum Co., Cincinnati, which was recently incorporated with $25,000 capital, to take over the business of the Warman Aluminum Castings Co., is reported planning to remove its plant on Dayton street to larger quarters at Gest street and the Baltimore & Ohio railroad.

The Meadows Mfg. Co., Pontiac, Ill., is reported planning to remove its plant to Bloomington, Ill., where it has purchased a plant site and will erect two buildings, 80 x 300 feet and 80 x 400 feet, as well as a foundry, pattern shop, offices, etc. The company manufactures agricultural implements.

Erection of a plant addition is reported being contemplated by the Slinger Foundry & Machine Co., Portage, Wis. H. W. Slinger is general manager.

Additions to the plant of the Modern Foundry Co., Oakley, Cincinnati, with new equipment which will be installed, will more than double the plant's present capacity.

The Moore Plow & Implement Co., Greenville, Mich., which recently increased its capital from $75,000 to $200,000, plans to enlarge its plant for the manufacture of plows. At the present time the company does not know just what new equipment will be needed, but according to D. H. Moore, president, will be in the market for a certain amount of foundry equipment.

A company is being formed at Hopkinsville, Ky., to manufacture a line of farm and mining machinery and its plant will be located in a small town in Oklahoma. The company plans to install a modern foundry and machine shop and desires to get in contact with manufacturers of foundry, machine shop and allied equipment. L. G. Williams, East View farm, R. 6, Box 50, Hopkinsville, Ky., is in charge of the project.

The Nortmann-Duffke Foundry Co., Milwaukee, has changed its name to the Nortmann-Duffke Co., in order to indicate the broadened scope of its operations. The company has been operating a metal perforating shop for some time and this department has grown to be as important as the gray iron foundry which the company operates. Franklin B. Giesler is vice president.

The American Shell Co., Patterson, N. J., has changed its name to the Gillespie Motor Corp., and its plant has been converted for the manufacture of motors, engines, etc. Plans have been completed for the erection of a foundry, 120 x 240 feet. With the change in the name the company also increased its capital from $500,000 to $5,000,000.

Plans are being prepared for the erection of an addition, 150 x 225 feet, to the plant of the Bridgeport Brass Co., Bridgeport, Conn. When completed it will be utilized as an addition to the casting department. The H. M. Lane Co., engineer, Detroit, is now drawing plans.

New Trade Publications

STEEL WINDOWS.—The Truscon Steel Co., Youngstown, O., is circulating a handbook in which steel windows are fully described and illustrated. The book is divided into three sections, the first of which deals with pivoted windows, which are generally used in industrial and commercial buildings. The various stock units of these windows are illustrated, and complete tables, diagrams, etc., are given. The second section is devoted to continuous steel sash, generally used in monitors and sawtooth roofs. Full details are given. Counterbalanced types of steel windows are treated in the third section. In this section all types of sliding sash are shown and are accompanied with illustrations and descriptions of window hardware. The booklet should be of especial value to those interested in the designing and erection of modern structures.

PLANT CONSTRUCTION.—Westinghouse Church Kerr & Co., Inc., engineers and constructors, New York, are circulating a 4-page leaflet containing a list of clients by whom the company was employed during 1918. According to the leaflet, the company served more than 40 clients during the year as engineers and constructors, and designed and built plants for the production of guns, shell, aircraft, turbines, high explosives, sulphur, brass and steel castings, forgings, carbide, leather, saws, lamps, superheaters, barrels, glass; railway shops and terminals, power plants, transmission lines, cantonments, loading plants, filtration plants, electric railways and workmen's houses.

HAMMER DRILL.—A 4-page leaflet is being distributed by the Star Expansion Bolt Co., New York, in which a spring hammer drill is described and illustrated. This drill is adapted to the use of electricians, plumbers and similar trades, and is said to have a capacity for drilling 1 inch per minute in brick or concrete. The barrel of the drill contains a hammer or plunger which is thrown rapidly back and forth by the alternate action of the cam and the spiral spring, so that it strikes a series of blows on the drill point holder. The drill is operated by a crank handle.

OIL HOLE COVERS.—Catalog No. 6 being circulated by W. W. & C. F. Tucker, Hartford, Conn., in which oil hole covers and cups are described and illustrated. Specifications and other data are given.

EXPORT SERVICE.—A small cardboard-bound booklet of 12 pages, entitled "Service," has been prepared by C. K. Thomas & Co., New York. The booklet points out the service on exports rendered by the company to its various clients.